IN THIS ISSUE: Power and Transmission Problems of Western Industry

JOURNAL OF ELECTRICITY

VOL. 43 NO. 5 SAN FRANCISCO, SEPTEMBER 1, 1919 PER COPY, 25 CENTS

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A Typical Installation of Moloney High Tension Transformers

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BREAKING A RECORD IN WATER WHEEL EFFICIENCY

The part which electricity plays in the operation of the giant lock system of the Panama Canal is strikingly presented in the article on page 198 of this issue. The great importance of this gateway of commerce to the Pacific Coast lends peculiar significance to the fact that it is in large measure Western genius, through the invention and development of the Pelton water wheel, which has made possible the electrical records established in the Canal hydroelectric plant at Gatun. The astonishing efficiency of 95.4 is reported of the operation of the Pelton water wheel in the official government records, an attainment which marks a new level of achievement for this type of turbine.

SEP -5 1919

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JOURNAL OF ELECTRICITY

DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 43 SAN FRANCISCO, SEPTEMBER 1, 1919 Number 5

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"The records of the accident insurance companies show that the great majority of injuries to employes is due to the fact that the injured persons could not read the printed warning signs. There are eight and a half million workers in the United States who are in danger because they cannot read the English language. Brought within the reach of the printed word, these persons will be worth at least five dollars a week more to themselves and to the nation as workers, which increased earning power alone would provide $2,000,000,000 a year more toward paying the interest on our war debt and help amortise it as well."

A New World Record in Transmission

The interconnection soon to be established between the distribution systems of the San Joaquin Light & Power Corporation and the Pacific Gas & Electric Company from Gustine to Newman, California, will mark a new world's record in interconnection, making the entire network of power lines of the West into virtually one great distributive system. For extent of service and area of territory served, there is nothing in the world which rivals this latest western achievement.

Connections have for some time been arranged between the San Diego Consolidated Gas & Electric Company, farthest to the south, and the Southern California Edison Company, and between the Edison Company and the San Joaquin Light & Power. To the north, the Oregon and California systems have been connected through Copco and the California companies have all been exchanging power to ease over peak loads. The five miles of line now to be added will complete this connection and make an actual continuous transmission system from Mexico and from Yuma, Arizona, on the south to Medford, Oregon, on the north. With the bridging of two trifling gaps to the north, this connection would be extended clear to the Montana lines.

Of course, there is no actual transmission of power from a plant at one end of this great system to a consumer at the other end, but it is surprising how far the wave from an unusual demand will travel. For instance, it is a fact that the entrance of the Pacific fleet into San Diego harbor seriously taxed the plants of the San Joaquin Light & Power Corporation. It seems that during the summer months the San Diego Consolidated Gas and Electric Company have had about 6000 kilowatts of electrical energy to spare. This has been taken by the Southern California Edison Company, and the San Joaquin Light & Power Corporation in turn drew upon the Southern California Edison Company for a like amount. This saved running water to that extent from the Crane Valley reservoir. The day the fleet arrived in San Diego the city was crowded with visitors and the street car system, hotels and all users of electricity were called upon to give a maximum service. Therefore, the San Diego company had to keep all of its electricity at home, which meant that the Southern California Edison would not have 6000 kilowatts to give to the San Joaquin that day. The result was that the Crane Valley plants had to be put into action to make up the shortage. If the Pacific Gas & Electric Company had had spare energy to furnish over an interconnecting line, the demand might have been passed up the state until this unusual load was shared even by the power companies of Oregon. The practical value in increased elasticity of service as well as the spectacular element in the breaking of a world record is revealed in such an incident as this. The principle of interconnection is a happy instance of cooperation in which the way has largely been pointed by the West, and in which the West has achieved most important results.

Mr. Kennedy's Message to the Public Utility

Much interest is being shown by electrical public utility heads throughout the United States in the remarkable series of articles by S. M. Kennedy, general agent of the Southern California Edison Company, which are to appear shortly in the Journal of Electricity. Mr. Kennedy needs no introduction to the electrical industry. His life work in one of our greatest public utility organizations, and his clear-minded, constructive enthusiasm in analyzing and adjusting the problems of the industry have won recognition throughout the utility life of our nation.

NEW ELECTRICAL DEVELOPMENTS

(Extensive irrigation developments are features of the Northwest news for the past two weeks. The Hetch Hetchy project is in the foreground in Pacific Central activities and the Southwest reports the coming erection of several large plants. Developments in the Inter-Mountain district comprise a little of everything, from street-lighting to irrigation.—The Editor.)

THE PACIFIC NORTHWEST

PASCO, WASH.—The Pasco-Page Telephone Company has been incorporated here.

SEATTLE, WASH.—A large quantity of electrical equipment will be required in connection with the construction of the proposed 18,000,000-ton dry dock at the plant of the Ames Shipbuilding & Dry Dock Company, including complete electrically operated pumping apparatus, motors, etc.

OLYMPIA, WASH.—Present valuation of the Pacific Power and Light Company properties serving Yakima, Walla Walla, Goldendale and White Salmon geographical divisions in eastern Washington has been fixed by the public service commission at $6,207,532, preliminary to granting an increase of rates.

SEATTLE, WASH.—Legislation has been set in motion to obtain congressional aid for the big reclamation project in Kittitas county, Washington. Representative Summers introduced a bill to appropriate $7,000,000 for expenditure on the Kittitas high line unit, which is to be an extension of the Yakima project.

VANCOUVER, WASH. — The question of draining Vancouver Lake assumed a trifle larger proportions when it was learned that the City Port Commission intends to investigate their interests in the affair. It appears that a recent session of the state legislature gave the lake to the Port Commission for the purpose of creating, some time in the future, a deep water harbor for Vancouver.

PENDLETON, ORE.—Despite the fact that it was impossible to obtain official assurance of the approval of the McKay creek dam project at this time because of lack of funds for any irrigation extension until the Lane bill or some other similar measure is passed by Congress, E. P. Dodd, who went to Washington as the representative of this district in the matter, returned feeling that, as soon as funds are available, the project will be among the first to receive attention.

KLAMATH FALLS, ORE.—That the lands on the eastern side of upper Langell valley will be formally added to the Langell valley irrigation project at the regular meeting of the board of directors on August 5 is now generally expected, as all of the preliminary arrangements for this move have been made. This addition will bring the total of the proposed irrigated area up to approximately 30,000 acres and nearly double the amount of land now covered by the United States reclamation service here.

SALEM, ORE.—John H. Lewis, engineer-manager of the Warm Springs irrigation project, arrived in Salem recently to confer with members of the irrigation securities commission. The project recently asked certification of bonds in the sum of $600,000 in addition to $750,000 in bonds previously certified. The project contains approximately 39,000 acres, 29,000 of which are subject to irrigation. Mr. Lewis was formerly state engineer and is well versed in irrigation matters.

SALEM, ORE.—The state irrigation securities commission has received an application from the Talent irrigation district in Jackson county for certification of bonds in the sum of $45,000. Money derived from the bonds will be used in new work. The district includes about 8000 acres and $175,000 in bonds already have been approved. The Squaw Creek irrigation district in Deschutes county has asked certification of an issue of $15,000 for new work. This district has 8000 acres, with bonds in the sum of $98,000 already issued.

KLAMATH FALLS, ORE. — Modification of the contract between the California-Oregon Power Company and the government, by the terms of which the former threatens to reduce the water level of upper Klamath Lake, is asked in a telegram to Secretary of the Interior Franklin K. Lane, sent by the timber interests, mill owners and others interested in timber or its manufacture in this section. It is pointed out that those signing the telegram have made heavy investments tributary to the lake, in mills, box factories and log canals, relying upon the natural condition of the lake.

BEND, ORE.—In preparation for the starting of immediate construction of a 1500 hp. unit on Tumalo creek, in case the agreement already approved by the state for power rights is endorsed by eastern officials of the company, preliminary work has been started by the Bend Water, Light & Power Company. A second unit of like capacity is planned, to be erected as need arises. According to surveys already made, a 4000-ft. line of 40-inch pipe will carry water from the Columbia Southern ditch, returning the water from the power unit to the creek. Power will be brought to Bend over an eight-mile transmission line. It is possible that another line may be built to include farmers of Tumalo and Deschutes among the electric light users of the county.

THE PACIFIC CENTRAL DISTRICT

BAKERSFIELD, CAL.—The Kern county supervisors have called a $40,000 water system bond election in the Oildale district for Aug. 5.

PASO ROBLES, CAL.—Daniel Fisher of San Jose has purchased 2000 acres of the Bolton estate and is planning an irigation system by wells.

PITTSBURGH, CAL.—Several bonding propositions are to be submitted to the people in the near future. Among these will be the installation of an electrolier lighting system.

LIVINGSTON, CAL.—A petition was presented to the Board of Supervisors of Merced county at their meeting on August 4th, asking for the organization of an irrigation district.

OAKDALE, CAL.—Plans are being prepared by the Calaveras Copper Company for a reservoir and power plant to supply electricity for their plant at Copperopolis, according to notice received by the Oakdale Irrigation District from the State Water Commission.

ANTIOCH, CAL.—The water supply is low and is liable to become worse from season to season as irrigation becomes more extensive at points above Antioch. Only one course appears to be open, and that is to try the experiment of sinking wells with a view to tiding over the low water period.

MARTINEZ, CAL.—Plans and specifications are being considered by the Contra Costa Gas Company for the construction of a modern dwelling house on their property at the corner of Melrose and Estudillo streets and the erection of a large gas storage tank. It is understood that the investment of the company here will exceed $10,000.

OROVILLE, CAL.—Reports on both the Oroville-Wyandotte and Honcut-Yuba irrigation districts will be made by the state engineer at the same time, and when they are ready the board of supervisors will call a special meeting for the purpose of fixing dates for the elections in the two proposed districts. A representative of the state engineer's office is expected in Butte county within a few days.

SACRAMENTO, CAL. — Oregon hydroelectric lines, connecting with California lines, are relieving the shortage of power in this state, which is greater than ever before, owing to unprecedented low water in all the streams. In addition it is reported that every steam power plant in the state is running to meet extra demands. Electricity is being generated from steam by the Pacific Gas & Electric Company.

MODESTO, CAL.—Bonds amounting to $609,000, to provide funds for the construction of an electrical power plant, will be voted on separately on the same ballot with the Don Pedro reservoir project, according to a resolution adopted jointly by the Modesto and Turlock irrigation district directors. The proposition as outlined would result in the construction of a power plant with a capacity of 40,000 horsepower and sufficient to take care of the full capacity of the proposed Don Pedro dam.

MARYSVILLE, CAL.—F. L. Fehren of San Jose, who recently was denied a petition for creating an irrigation district by the board of supervisors of Yuba county, with the privilege of taking water from the Yuba river in this county, has made application to the state engineering department for 500 feet per second of waters of the Yuba and Feather rivers to irrigate 50,000 acres of land in Yuba county. The main canal which Fehren proposes to build will be forty miles long, the application states.

MARYSVILLE, CAL.—Competition with the Pacific Gas & Electric Company and the Great Western Power Company in furnishing electricity to Marysville, Sacramento and other valley towns is planned by the Marysville and Nevada Power and Water Company. Immediate construction of the first unit of the proposition is to commence at Bullard's Bar, near here. The contract for building the dam has been let to a San Francisco firm. The firm dam will be 40 feet high, to be increased next summer to 170 feet. Fifty men will be put to work to build it.

PORTERVILLE, CAL.—The Santa Fe Railroad has purchased from the Visalia Electric Railway branch lines constructed through newly opened citrus territory to connect with the Porterville Northeastern, a Southern Pacific subsidiary. Consummation of this deal, it is said by Santa Fe engineers here, means immediate construction of the proposed Porterville-Ducor branch of the Santa Fe, the leasing of trackage from the Southern Pacific from Ducor to Oil City, and the future routing of transcontinental traffic by the Porterville branch.

NEVADA CITY, CAL.—The capacity of Lake Van Orden, one of the storage reservoirs of the Pacific Gas & Electric Company, near the summit of the Sierras, is being enlarged by raising the dam an additional five feet. A large crew of men and necessary materials have been assembled, and the work will proceed rapidly. The water of Lake Van Orden is conveyed by canal to Lake Spaulding, fifteen miles to the west, and becomes a part of the great power generating system of the company. An additional unit is being added to the Lake Spaulding dam.

OROVILLE, CAL.—That if an irrigation district is organized in the Thermalito and Table Mountain sections, the Pacific Gas & Electric Company will guarantee to furnish water for at

least 20,000 acres, was the statement made by President John A. Britton of the Pacific Gas & Electric Company, to the Chamber of Commerce. Mr. Britton stated that the rehabilitation of the Thermalito distributing system, of the construction of the Concow impounding dam, and a more careful use of water would enable 20,000 acres to be irrigated in Thermalito and Table Mountain.

SAN FRANCISCO, CAL.—Bids opened by the Board of Public Works for the construction of the Hetch Hetchy dam in the Tuolumne river revealed the Utah Construction Company of Ogden and San Francisco as the low bidder on both types of dam asked for in the specifications. The only other bidder was R. C. Storrie & Co., of San Francisco. The Utah Construction Company offered to build the dam with an overflow spillway and radial gates for $5,369,808.50. The Storrie bid on the same work was $5,431,010, a difference in favor of the Utah of $61,201,50. Upon the alternative bid for the dam with a syphon spillway the Utah company bid $5,446,-792.50, while the Storrie bid was $5,475,910, a difference of $29,117.50 in favor of the Utah company. The contract for the dam was awarded to the Utah Construction Company, and since the announcement there has been a steady sale of the Hetch Hetchy bonds.

REDDING, CAL. — Proposed irrigation projects, which would turn water on thousands of acres of fertile land in northwestern Shasta and Modoc counties, are being investigated by State Engineer W. F. McClure. The state official is accompanied by Secretary-Manager Chase of the Northern California Counties Association. The first project to be viewed will be on the McArthur estate, where it is proposed to irrigate 5000 acres and subdivide the land. Then Mr. McClure will go over into Big Valley to decide on the feasibility of a project which is planned to irrigate 22,000 acres. The inspection trip will end with a trip through Modoc county, the state engineer paying particular attention to Jess Valley, an irrigation project of 40,000 acres. Land owners in this district hope to get state financial cooperation in making the surveys. The High Sage and Crook's Canyon projects of 10,000 acres each also will be brought to the attention of the state engineer.

THE PACIFIC SOUTHWEST

PASADENA, CAL.—The Pacific Electric Company will install heavy girder rails and repave its right-of-way in Colorado street between Broadway and Lake.

LOS ANGELES, CAL.—The city council has called an election in the Westgate District for August 13 to vote on issuing $700,000 bonds for constructing a water distributing trunk line.

IMPERIAL, CAL. — Imperial Irrigation District bonds to defray the expense of construction and maintenance of a water system from Hanlon Heading, to connect with canals of the local water companies, will be voted on soon.

PASADENA, CAL.—Work will begin soon on the construction of High Dam at Devil's Gate. The dam is to be 100 ft. wide at the bottom, tapering up to 80 ft. in width at the top. The structure will be more than 100 ft. high.

VENICE, CAL.—Mayor A. E. Coles has appointed a committee to investigate the proposed centering of the Pacific Electric tracks on the trolleyway. Venice and Santa Monica are anxious to have the tracks centered through both cities.

LOS ANGELES, CAL.—The Public Service Commission has under consideration the feasibility of having aqueduct water carried into about 20,000 acres of land in the Corojo Valley, Ventura county. It is suggested that water now allowed to run down the Santa Clara river during the winter season might be used by being impounded in reservoirs and released in the summer.

PHOENIX, ARIZ.—A resolution has been passed by the Public Service Commission declaring intention to construct a conduit of reinforced cement concrete to take care of the Salt River Valley Canal between the east line of Central avenue and the east line of Third avenue. A 4-inch centrifugal pump is to be erected at Third avenue for lifting water from the canal for irrigation purposes.

LOS ANGELES, CAL. — The new packing plant to be erected at Vernon by the California Provision Company of Los Angeles will consist of a number of buildings, including a boiler plant and refrigerating plant. The cost for equipment has been estimated at about $75,000; the figure for the entire plant at $125,000. The contract has been awarded to Charles B. Harp of Los Angeles.

POMONA, CAL.—Promoters of the irrigation district southwest of San Dimas, in which 20,000 acres will be supplied with water from San Gabriel Canyon, have made formal request to the State Water Commission for the privilege of diverting water from San Gabriel river and Puddingstone Canyon. A reservoir is planned to be built in the bed of Puddingstone Canyon—water to be brought down from San Gabriel river, San Dimas Canyon, etc.

EL CERRITO, CAL.—Voters of El Cerrito have decided against two bond issues totaling $70,000 by failing to give the issues the necessary two-thirds majority to carry them. Proposition No. 1, providing $60,000 bonds for a storm sewer system, lost by a vote of 105 for the bonds and 80 against. Proposition No. 2, for $10,000 for fire-fighting equipment, lost by a vote of 88 for the bonds and 96 against.

LOS ANGELES, CAL. — The Goodyear Tire and Rubber Company of Akron, Ohio, has acquired a site near Los Angeles on which it proposes to erect a new plant. The works will consist of a group of buildings to include every department of operation, as well as an electric power station. The entire cost is estimated at about $4,000,000, and a California corporation will be organized to construct and operate the plant.

LOS ANGELES, CAL.—Wage increases of from 2 to 3 cents an hour, affecting thousands of employes of the Los Angeles Railway Company and the Pacific Electric Company's lines, are announced. High cost of living was given by railway officials as the reason for the increases. Pacific Electric motormen and conductors will be paid from 41 to 49½ cents an hour; freight motormen, 53 cents an hour; brakemen and switchmen, 48 cents; trolleymen, 43 cents, and yard foremen, 53 cents. The Los Angeles Railway Company is paying practically the same scale.

SAN DIEGO, CAL.—Contracts calling for the expenditure of approximately $1,000,000 for the installation of sewer, water and lighting systems and construction of the industrial group of permanent buildings, including administration building, power houses, storage plants and additional barracks at the marine brigade post in Dutch Flats, are expected to be awarded in September. Announcement was made by Com. Norman Smith, public works officer for the Twelfth Naval District, that plans and specifications for the proposed work are now being completed by public works officials.

THE INTER-MOUNTAIN DISTRICT

BRIGHAM CITY, UTAH.—Steel poles for the new street lighting system for this city have arrived and will be immediately put in place.

UNCON, IDA.—The Utah Power & Light Company is extending its distribution system to the eastern part of this town to take care of customers in this section.

PRESTON, IDA.—A certificate of convenience and necessity has been issued by the Idaho Public Utilities Commission, granting the Utah Power & Light Company permission to extend its lines into Franklin county, beyond Preston.

OGDEN, UTAH.—Efforts are being made by merchants and others interested in this city, to induce the Utah-Idaho Central Railroad to build an interurban line from Ogden through West Ogden and thence to West Weber and Plain City.

PRESTON, IDA. — A special election was held in the village of Weston, on the 11th of August, for the purpose of voting upon the issuance of municipal coupon bonds in the amount of $8000, to pay the cost of constructing an electric light and power distributing system.

SALT LAKE CITY, UTAH.—The electrification of the Salt Lake, Garfield & Western Railway Company's line between Salt Lake City and Saltair Beach has finally been completed and the six new electric cars will be put into service, commencing August 3rd. Fifteen-minute service will replace the old schedule of forty-five minute service with this change.

POCATELLO, IDA.—Lightless nights may be inaugurated throughout certain districts of the state of Idaho to permit greater use of electricity for irrigation pumping purposes. A great demand has been made on the Power Company for current to pump water for irrigation on account of the extremely dry season, with resulting tax on the capacity of the various plants.

CARSON, CITY, NEV.—The Public Service Commission has granted the Bell Telephone Company permission to extend its lines to Tonopah. The extension will enable residents of Tonopah and Goldfield to talk direct with Reno and San Francisco. The company purposes to string its wires on the poles of the Western Union Telegraph Company, and to connect with the system of the Nevada-California Telephone Company, which has served the people of southern Nevada for several years.

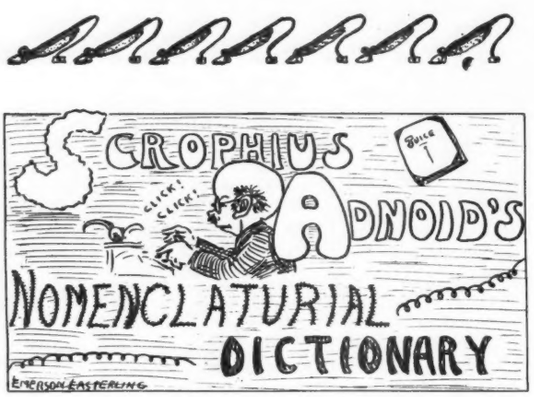
CARSON CITY, NEV.—The irrigation of Eagle Valley is a question that has been seriously considered for some time, and various plans have been proposed. Now that the Upper Carson dam seems in a fair way to be constructed interest has revived and serious thought is given to the matter of including Eagle Valley in the project. State Engineer Scrugham has announced that he and R. Conklin of the department of the interior will make a reconnaissance of the different projects capable of development in the state and the Eagle Valley project will be included in the general survey.

BOISE, IDA.—The installation of a new unit at the Lower Salmon Falls plant of the Idaho Power Company has just been completed and 4000 hp. additional output secured. This capacity will aid materially in providing necessary current for irrigation purposes for which there is an enormous demand this year. The question of interconnecting the system of the Idaho Power Company with that of the Utah Power & Light Company is also being considered by the officials of the two companies and the Public Utilities Commission. Such an interconnection would materially aid the Idaho Power Company in taking care of business in the west end of the territory which it now serves.

LOGAN, UTAH.—The installation of a new ornamental street lighting system for the principal business streets of Logan will take place shortly, according to plans now being perfected by Mayor Bullen and the City Commission. Everything incident to the installation is ready and the contract for actual construction will be let in the very near future. The installation of the new system will mark the end of the old wooden telephone poles which have been on the streets for several years. New and ornamental poles will support the street car trolley wires and the new lines. The new lighting district planned will cover from First South to Third North on Main street, from First West to First East on First North. On Main street two lights will be placed on each pole and on the other streets only one lamp will be on each pole.

THE VACUUM CLEANER —— THE VACUUM CLEANER —— THE VACUUM CLEANER —— THE VACUUM CLEANER

CASUAL FACTS ABOUT OURSELF and about you, a bit of poetry written by a mutual acquaintance and a good story if we happen to have one on hand—that is what you will find on this page. Take it for granted you have dropped in for a chat in our office and are being entertained while you wait by the office boy or, as we have personified it here, the office Vacuum Cleaner. You would hear a touch of gossip and then besides, some of the more important items of life which formality excludes from the regular columns of a technical magazine. This rich harvest has been placed in care of our electrical janitor and is here presented for the diversion of an idle moment.—The Editor.



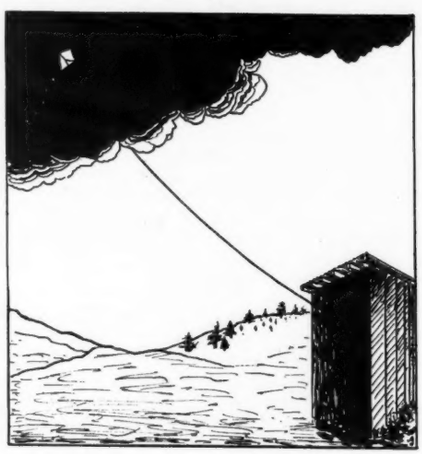
SCROPHIUS ADNOID'S NOMENCLATURIAL DICTIONARY

Ampere—Gallons per minute of juice.
Battery—Juice barn.
Current—Amount of amperes that the voltage shoves along the line.
Direct current—The straight goods in the electrical line; no come-back.
E.M.F—No, it is not a make of automobile. It is the goods.
Farad—The reputation of a condenser.
Ground—Anything from a wet fence post to a person that the juice finds a circuit through back to the source.
High tension—Hot stuff.
I—An algebraic symbol by which the dopers try to figure out just how much it is going to cost Mrs. Ivan Ovalidtch to burn that new toaster of hers for ten minutes per day for seven weeks.
Juice—That's telling.
Kilowatt—What the meter-users worry about.
Laminations—The things the kids use for sailers when a transformer burns out.
Micro-farads—The way you measure the capacity of the condenser that goes onto your medical shocking coil; if you are very nervous you even do some subdividing of the micro-farads.
N—It does not necessarily mean "nothing," but we will let it stand for it this time.
O—The amount the average lineman's brains would total if asked to answer electrical questions in an examination.
Power factor—The stuff that the guy that owns the plant is interested in.
Resistance—The junk that keeps the meter from doing a fandango when a circuit is closed.
Secondary—The opposite of primary.
Theory—That with which the engineers try to bulldoze the public into their way of thinking.
Unit—A lot of things. Sometimes a generator in a power plant.
Variation—The condition that enters into a man's pay check when he lays off.
X-ray—The stuff the doctors burn you up with trying to cure you of some new kind of psychic disease.
Y—This must be a misprint as you see it in any electrical work—perhaps it is not, though.
Z—Probably stands for the time that a man puts in telling the other fellow how he used to raise the dickens when he was on a floating gang.

—EMERSON EASTERLING.

ENGINEERS OF YESTERDAY—15. FRANKLIN

(Series compiled by A. L. Jordan)



During the performance of the famous "kite experiment," where was Franklin?

Safe and dry in the shed pictured above by the artist. The experiment was of such great importance because it was the first proof (1752) of the identity of lightning and the electric spark and led to the invention of the lightning rod.

Benjamin Franklin (1706-1790) was one of the world's great geniuses. Apprenticed to a tallow-chandler, becoming a printer, then a writer, organizing the first police force and fire company in Philadelphia, interesting himself in education, in paving, lighting and building hospitals, organizing the American Philosophical Society, he here became postmaster. The pages of United States history record other public achievements, as his connection with the "Stamp Act," being on the first foreign mission (to England), assisting in drawing up the Declaration of Independence, culminating in appointment as Commissioner to France. He was made a member of most of the important societies of the world, including the Medical Society of London and the Royal Society. His activities in scientific and practical lines were numerous. Among others they were investigations as to the causes of earthquakes and whirlwinds, aeronautics, navigation (water-tight compartments, floating anchors, oil for calming high waves) and clock-making. He invented bifocal eyeglasses, the "Franklin stove" (our hot-air furnaces use the principle) and a remedy for smoking chimneys. He ventured to oppose Newton's theories of light, believing in the existence of ether waves. In his later years we read of his advocating the abolition of slavery. His best known work is his "Autobiography."

THE VACUUM CLEANER —— THE VACUUM CLEANER

—No. 4

THE VACUUM CLEANER — THE VACUUM CLEANER — THE VACUUM CLEANER

JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor — CLOTILDE GRUNSKY, Associate

VOLUME 43 — SAN FRANCISCO, SEPTEMBER 1, 1919 — NUMBER 5

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TERMS OF SUBSCRIPTION: United States, Cuba and Mexico 2.50 per year; Dominion of Canada $3.25 per year; elsewhere $4.00 per year; Single Copies, current month 25c each.

Entered as second class matter Jan. 1, 1917 at the San Francisco Post Office

PUBLISHED SEMI-MONTHLY BY THE

TECHNICAL PUBLISHING COMPANY

ELECTRIC BUILDING, 171-173 SECOND ST., SAN FRANCISCO

Member Audit Bureau of Circulation

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Index to Advertisers—page 20 Where to Buy in the West—pages 21-26

BREAKING A RECORD IN WATER WHEEL EFFICIENCY

The part which electricity plays in the operation of the giant lock system of the Panama Canal is strikingly presented in the article on page 198 of this issue. The great importance of this gateway of commerce to the Pacific Coast lends peculiar significance to the fact that it is in large measure Western genius, through the invention and development of the Pelton water wheel, which has made possible the electrical records established in the Canal hydroelectric plant at Gatun. The astonishing efficiency of 95.4 is reported of the operation of the Pelton water wheel in the official government records, an attainment which marks a new level of achievement for this type of turbine.

JOURNAL OF ELECTRICITY

DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 43 SAN FRANCISCO, SEPTEMBER 1, 1919 Number 5

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"The records of the accident insurance companies show that the great majority of injuries to employes is due to the fact that the injured persons could not read the printed warning signs. There are eight and a half million workers in the United States who are in danger because they cannot read the English language. Brought within the reach of the printed word, these persons will be worth at least five dollars a week more to themselves and to the nation as workers, which increased earning power alone would provide $2,000,000,000 a year more toward paying the interest on our war debt and help amortise it as well."

A New World Record in Transmission

The interconnection soon to be established between the distribution systems of the San Joaquin Light & Power Corporation and the Pacific Gas & Electric Company from Gustine to Newman, California, will mark a new world's record in interconnection, making the entire network of power lines of the West into virtually one great distributive system. For extent of service and area of territory served, there is nothing in the world which rivals this latest western achievement.

Connections have for some time been arranged between the San Diego Consolidated Gas & Electric Company, farthest to the south, and the Southern California Edison Company, and between the Edison Company and the San Joaquin Light & Power. To the north, the Oregon and California systems have been connected through Copco and the California companies have all been exchanging power to ease over peak loads. The five miles of line now to be added will complete this connection and make an actual continuous transmission system from Mexico and from Yuma, Arizona, on the south to Medford, Oregon, on the north. With the bridging of two trifling gaps to the north, this connection would be extended clear to the Montana lines.

Of course, there is no actual transmission of power from a plant at one end of this great system to a consumer at the other end, but it is surprising how far the wave from an unusual demand will travel. For instance, it is a fact that the entrance of the Pacific fleet into San Diego harbor seriously taxed the plants of the San Joaquin Light & Power Corporation. It seems that during the summer months the San Diego Consolidated Gas and Electric Company have had about 6000 kilowatts of electrical energy to spare. This has been taken by the Southern California Edison Company, and the San Joaquin Light & Power Corporation in turn drew upon the Southern California Edison Company for a like amount. This saved running water to that extent from the Crane Valley reservoir. The day the fleet arrived in San Diego the city was crowded with visitors and the street car system, hotels and all users of electricity were called upon to give a maximum service. Therefore, the San Diego company had to keep all of its electricity at home, which meant that the Southern California Edison would not have 6000 kilowatts to give to the San Joaquin that day. The result was that the Crane Valley plants had to be put into action to make up the shortage. If the Pacific Gas & Electric Company had had spare energy to furnish over an interconnecting line, the demand might have been passed up the state until this unusual load was shared even by the power companies of Oregon. The practical value in increased elasticity of service as well as the spectacular element in the breaking of a world record is revealed in such an incident as this. The principle of interconnection is a happy instance of cooperation in which the way has largely been pointed by the West, and in which the West has achieved most important results.

Mr. Kennedy's Message to the Public Utility

Much interest is being shown by electrical public utility heads throughout the United States in the remarkable series of articles by S. M. Kennedy, general agent of the Southern California Edison Company, which are to appear shortly in the Journal of Electricity. Mr. Kennedy needs no introduction to the electrical industry. His life work in one of our greatest public utility organizations, and his clear-minded, constructive enthusiasm in analyzing and adjusting the problems of the industry have won recognition throughout the utility life of our nation.

The "man in the street" policy of public service, as outlined before the third annual convention of the Pacific Coast Section of the National Electric Light Association and published in the Journal of Electricity, has already permeated the industry with a new vision of utility service.

So helpful has this one article proved that Mr. Kennedy has responded to the insistent need for a complete handbook of public utility practice with a series of twelve inspiring articles, based on his lifetime of successful experience, and carrying to the utility executive, to his employe and to the "man in the street" a vision of the full possibilities of public utility service.

For the utility executive, Mr. Kennedy constructs a definite and specific policy governing personal relations both within and without the organization. He emphasizes for the utility employe the especial responsibility and opportunity of personal contact with the public. He presents a frank and convincing survey of the problems and the ideals regulating present day utility service which should reach every customer of every public utility company that is endeavoring to enlist the sympathetic cooperation of its public.

Proposed Changes in the Patent System

Millions of dollars are invested in patents in the United States. Patent rights form the basis of many of the great electrical organizations. Indeed, it may justly be said that upon the justice and intelligent enforcement of its patents depends the industrial and commercial success of this country.

With this in mind, the National Research Council recently appointed a committee of scientists and patent specialists to give careful thought to the American patent system and to suggest any improvements deemed advisable. This committee was made up of the following:

Dr. Wm. F. Durand, chairman; Dr. Leo H. Baekeland and M. T. Pupin, scientists and inventors; Dr. Reid Hunt, physician; Dr. S. W. Stratton and R. A. Millikan, scientists and Frederick P. Fish, Thomas Ewing and Edwin J. Prindle, patent attorneys.

The committee has made four definite recommendations which have since been embodied in bills introduced into Congress.

The first of these related to the institution of a single court of Patent Appeals to sit in Washington in place of the present nine courts, each of which is the court of last resort within its own circuit. It is believed that this higher court will do much to clarify patent law and by its successive decisions, do away with conflicting precedents which have arisen.

The second, and perhaps the most revolutionary of the recommendations is that of the severing of the Patent Office from the Department of the Interior and its formation into a distinct bureau so that its appropriations and other needs may be independently considered. A matter of such importance to the industrial welfare of the country should be decided purely on the basis of its merits and not in competition with the needs of other bureaus as must necessarily be the case when its appropriation is included within that of a cabinet department. The present is a most convenient time for the segregation, as the proposed reorganization of the Department of the Interior into the Department of Public Works would leave the Patent Office without a sponsor.

In some sense as a corollary to this action, the committee has recommended an increase in the salaries of the examining corps, in order to encourage a higher type of technical assistance. A further suggestion makes provision for adequate compensation to the owner for past infringement.

These recommendations are made by a committee of exceptionally high standing from without the Patent Office and are believed to merit the encouragement in all possible ways of all interested in the betterment of our patent system.

The Department Store in the Electrical Field

A sign of the times is to be seen in the fact that several department stores in Western cities have recently enlarged their electrical departments, installing electric kitchens and laundries and featuring electric conveniences to the housewife in their newspaper advertising. This general recognition of electric ware as one of the accepted adjuncts of a home is evidence of the steady advance of the electric idea in the household of the average woman.

Although the department store in many respects is a formidable rival, the up-to-date retail electrical merchant should welcome this wider spreading of the electrical gospel. A report from an electric sign company shows that their business in one California city was substantially increased by the campaign carried on in that community by their competitors. The more washing machines and electric ranges are sold in a community, the more that community is ready to buy. Let the department store sell its customers. If the electrical contractor-dealer is giving a better service, as with most prosperous establishments is the case, he will cash in on the interest thus spread broadcast in the community. Trade is not to be arbitrarily diverted from any one channel to another—it finds the easiest outlet. All the electrical dealer has to do is through an attractive store and a skilled service to make his opening the easiest, and trade will naturally come to his door.

The Chances for Water Power Legislation

The water power bill has passed the House and is now awaiting ratification at the hands of the Senate. It is expected that the Senate bill which corresponds to that passed by the House will be reported promptly out of committee and given precedence over other matters involving more lengthy debate. It is to be hoped in justice to the power needs of the nation, which are no less acute than during the period of the war, that the Senate will make a special effort to this end. The failure of legislation which would encourage invest-

ment has been a factor in the power shortages of the last two years in the West.

The bill as it now stands provides for the creation of a Federal Power Commission to be composed of the Secretaries of War, of the Interior and of Agriculture, to which are given the powers relative to water power development hitherto handled by their various departments. The terms of the license provide for a period of grant not to exceed fifty years. Provisions are also made for the regulation of the rates to be charged to consumers by the grantees. Penalties are provided for entrance into combinations or monopolies in restraint of trade on the part of grantees. Suitable penalties are prescribed for the violation of the terms of the provisions of the act.

The bill is substantially that recommended a year ago and deserves prompt ratification.

Reorganizing the A. I. E. E.

A most thoroughgoing revision of every line of association activity has been proposed by the Development Committee of the A. I. E. E. Briefly, these changes involve:

1. An enlargement and popularization of the Proceedings.
2. More officers from a wider area, with fewer meetings.
3. Decentralization—the fostering of local sections; the holding of meetings elsewhere than in New York; the formation of a New York section.
4. The encouragement of younger members entering into activities.
5. The wider participation of the engineer in public affairs.
6. The federation with other engineering bodies, both locally and nationally.
7. The broader education of engineers, to be secured by a six-year college course.

These proposals are almost revolutionary in the breadth of reorganization they propose, but so nicely are they suited to the spirit of the association, that in regard to most of them very little has been heard except in their commendation. The decentralization of the national body and the fostering of local section development is but one phase of a general movement in this direction whose manifestations are to be seen in all national organizations. It is generally recognized that the engineer should take a more prominent part in public affairs and the federation of local engineering branches to present a stronger unit of influence is again merely a reflection of a principle already recognized.

The major exception to this general acceptance of the committee's report seems to be the change in the form of the Institute Proceedings. While it seems to be generally felt that there should be a broader policy as regards the matters of interest presented in addition to the technical papers, there has developed a widespread protest against the transformation of the proceedings into merely another technical magazine. The attempt to extend the advertising columns is felt to be an unwarranted intrusion of the association into the field of the technical press with which they have no aspiration to compete. It is of course recognized that under no consideration should the technical standards of the present be lowered. Under some protest, but under the urge of a broader service, the technical press has gradually come to occupy a semi-popular field in which the severely scientific subject of special application plays only a limited part. Nevertheless these treatises have their legitimate and important place—when a man wishes to find up-to-date technical data on a given particular, it should be available. Most legitimately, the refuge of such papers has been their publication by engineering societies. As organs of the national engineering bodies, the association papers have an appropriate field in the maintenance of association unity and the uplifting of engineering standards through their columns, as well as the many personal services of an organization, but it must not be forgotten as well that the providing of an avenue for the presentation of technical advances is one of their important reasons for existence.

A Postponed Convention

Announcement has come from the Northwest that the September convention of the Northwest Electric Light and Power Association has been postponed from September 10th, 11th and 12th and will be held in Seattle on September 24th to 27th. This change was made necessary by the visit of the fleet to Seattle during the earlier period and the consequent crowding of hotels which makes the securing of accommodations for a convention out of the question.

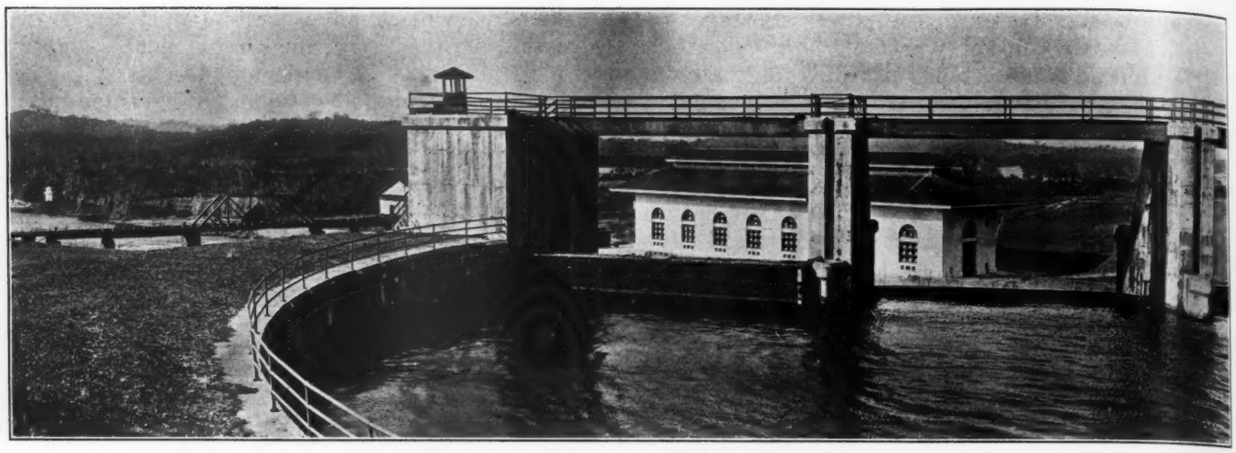
This modification in dates makes possible a wider attendance of electrical men from elsewhere on the Pacific Coast as it gives a longer period in which to make plans and adjust work for the fitting in of the northern trip. The inspiration of these meetings in the past has been one of the events of the electrical year in the West and a large attendance from California and the Southwest and Inter-mountain district is looked for.

All those intending to attend this gathering from the Pacific Central region are urged to report their names to this office. If enough delegates can be secured, it is planned to arrange for a special car from San Francisco under the auspices of the Journal of Electricity.

NEW JOURNAL SERVICE: An account of the original experiment in Customer-Ownership as conducted by the Pacific Gas & Electric Company in 1914 and a survey of the extent to which this principle has permeated central station financing will be the feature of the September 15th issue of the Journal of Electricity. Merchandising and power plant records of the Northwest will also be presented in this number.

A special washing machine and vacuum cleaner edition is planned for October 1st. If you have recently carried out a successful campaign along these lines, let the rest of the industry know about it through this number of the Journal of Electricity.

Attention is called to the announcement of a Pan-Pacific Number for November 1st which appears in the advertising pages elsewhere in this issue. Advertising reservations for this issue, which is to reach the principal electrical purchasers of the entire Pacific area, should be received by September 15th and advertising copy by October 1st.



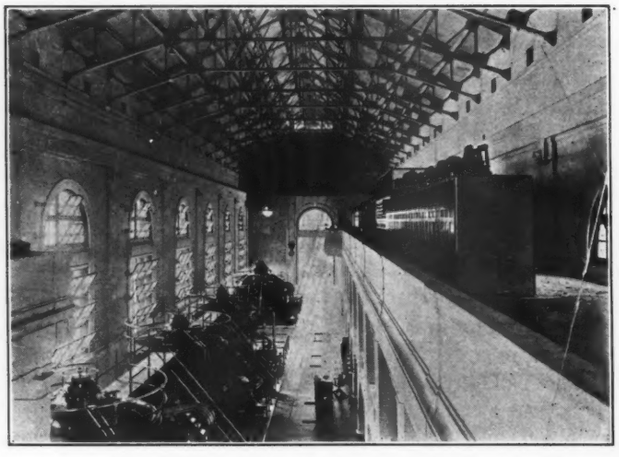
HYDROELECTRIC PLANT AT GATUN SPILLWAY

The plant has several times been enlarged to meet the growing demands of the canal zone. The new building is planned to house 3 new units which will bring the ultimate capacity of the plant to 22,140 kw.

Development of the Gatun Hydroelectric Station

(The details of the recent improvements in the power plant which furnishes power for the operation of the Canal. These extensive changes were made without interruption of service and the story of their accomplishment is one of especial interest. The Pelton installation at the new plant has already broken a record in water wheel operation through the attainment of a 95.4 efficiency. The data here presented formed part of the official government report on progress at this station.—The Editor.)

In the original construction of the hydroelectric station at Gatun spillway, the capacity of the generators installed was 6,000 kilowatts. Provision of penstocks was made for the installation of three future units aggregating an additional 6,000 kw. which would double the plant, giving a proposed capacity of 12,000 kw. Through the increase in consumption of electric power along the Canal it has been necessary to increase the capacity of the plant beyond the original maximum estimate. The plant has now a capacity of 13,140 kw., and provisions have been made for the future installation of two more units of 4,500 kw. each, giving an ultimate capacity of 22,140 kw.



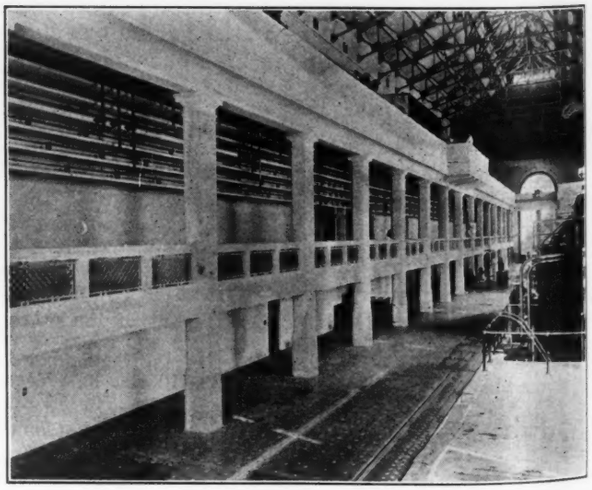
INTERIOR OF THE GATUN PLANT

The generators installed looking down from the balcony. The remarkable feat of remodeling the entire plant was accomplished without interruption of service.

The developments were made while the plant was in use and with no interruptions of the service. An interesting feature was the change, at the same time, in the operating or bus voltage, which was raised from 2,200 to 6,600 volts for transmission to the substation at Gatun and subsequent distribution, at 44,000 volts, to the other substations of the transmission system. The voltage from the three original generators was raised by the installation of auto-transformers while the new unit generates directly at the 6,600-volt station potential. The switching gear and connections were revised as necessary in connection with the increase of voltage.

The station was first placed in service during July, 1914; and in January, 1915, after completion of the transmission lines, the entire load on the power system was transferred to this plant.

The original capacity of this station as designed and installed was 6,000 kw., divided into three units of 2,000 kw. each. Shortly after the station had

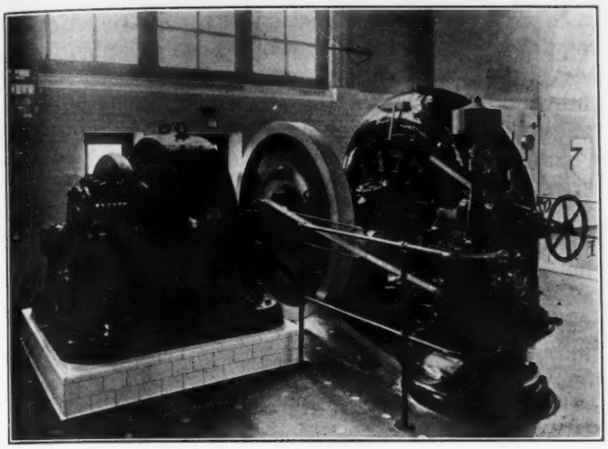


HIGH TENSION BUS

An interesting feature in the increase of the plant capacity was the change in the bus voltage which was raised from 2200 to 6600 volts for transmission to the Gatun substation and 44000 volts to other stations.

been placed in service the load on the power system during certain periods reached such a stage that the steam station at Miraflores had to be used to help carry the load. During this interval, studies were being made toward increasing the capacity of the hydroelectric station to handle this additional load.

The first work accomplished along these lines was done during the latter part of 1916. The original water wheels in turbines were taken out and



EXCITER No. 6

Additional exciter capacity was gained by the addition of a 275-kw. turbine driven exciter supplied with water from a 40-in. connection to two of the 12-ft. penstocks.

replaced with wheels of a different design and slightly increased size; a certain section of the turbine casing being bored out to allow the larger size wheel to be used. This change in size and design of water wheels in the three original units increased the capacity of the latter from 2,000 kw. to 2,880 kw. each, and the capacity of the station as a whole from 6,000 kw. to 8,640 kw., a total of 2,640 kw., or 44 per cent.

Further studies of load conditions on the power system clearly indicated that the above changes would relieve the situation only temporarily. Preliminary plans were started for making extensions to the station that would not only provide for the immediate requirements of the system but would also take care of future increased load. When the original station was designed, certain provisions were made for the future installation of three additional units of the same size as the original ones. By enlarging the station along the lines originally planned, the maximum capacity of the completed project would be 17,280 kw. The completed studies of the power situation showed that the limit of capacity of station, if enlarged only to the extent of the original plans (i. e., 17,280 kw.), would be reached and possibly exceeded in a short time. These studies resulted in the making of plans that would allow the maximum capacity to be developed in this station, consistent with general plans and details of original installation.

Final Plan

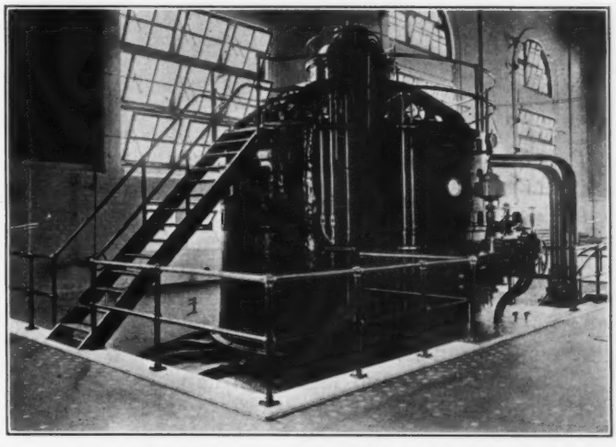
The principal factors limiting the size of units to be installed in this new extension were building limitations and the size of the head gate structure, which had been built to accommodate future units the same size as those originally installed. However, the final study of all details proved that the extension of this station could be made by the installation of three units of 4,500-kw. capacity each, which would increase the ultimate capacity of the station from 17,280 kw. to 22,140 kw.

Detailed plans were made and the final extension of station, in so far as size of units and ultimate capacity of station were concerned, was carried out as indicated above. The requirements of the power system did not call for the complete installation of all three units at this time, and the installation of only one of the 4,500-kw. units was accomplished.

The actual work on this extension was started in December, 1916. The west end of the main building was demolished and excavation for the foundation of the new structure was started. The building extension was carried out along general lines similar to those of the original structure, some minor details in connection with interior dimensions of the building being modified to allow for increased size of new units and changes in layout of switch gear.

In order to change from the plans as originally made for the extension of this station, certain changes and modifications had to be made in the original equipment and general layout of the station. A brief outline of each of these changes, under its respective heading, follows:

Foundations.—The foundations for larger size units in the new section of the building are practically the same as in the original station. Recesses



ONE OF THE GENERATOR UNITS

The station has been in satisfactory operation since the completion of changes in November, 1918.

were made in the main building wall to accommodate the increased size of the spiral casing of the turbine.

Draft tubes.—The draft tubes of the original turbines were of steel imbedded in the concrete foundation. The draft tubes of the new units were made of concrete and made an integral part of the foundation structure.

Tail-race.—On account of the increased volume of water discharged through the larger size units, changes had to be made in the design of the tail-race. The old structure, which was made up of six small arched openings in the spillway wall, was demolished and replaced with one single arched opening; this

eliminated the necessity of intervening piers, which had obstructed the discharge of water from the turbines and decreased the effective head.

Headgates and penstocks.—The penstocks supplying water to the original units are 10 feet 6 inches in diameter, with headgate valve of the same dimension. On account of original work that had been done on the headgate structure, the size of the headgate valves and about 25 feet of penstock for the larger units were limited to that size. This diameter of penstock (10 feet, 6 inches) was increased to 12 feet just outside the gate house and was continued to a point where it was reduced for connection to the spiral casing of the turbine. The headgate and penstock installations were completed for all three units. A 40-inch connection was made to two of the 12-foot penstocks just outside the main building for supplying water to the turbine-driven exciter of 275-kw. capacity.

Main units.—The original units in this station developed 2,880 kw., operated at 2,200 volts, and ran at a speed of 250 r.p.m. Each unit had an exciter mounted on the main shaft. The oil pressure required for operation of the governor was 80 pounds. The new units, as installed, developed 4,500 kw., operated at 6,600 volts, and ran at 187.5 r.p.m. The oil pressure required to operate the governor is 150 pounds. No exciters were mounted on the shafts of these new units.

In order to adapt the oil-pressure system to both sets of governors, the original oil pumps were replaced with new ones that would handle oil against the higher pressure required for the governors on the new units. The old governors were originally designed to operate satisfactorily at this higher pressure. Tests were conducted to check up this latter detail.

These oil pumps, as originally installed, were equipped with alternating current motor drive. When the change in pumps was made, the type of motor was also changed. These oil pump motors now operate on direct current. This change in type of motor drive improved certain operating characteristics of the station. Changes were also made in the type of governor drive on old units to conform to that on new units. With the exception of minor mechanical details and increased capacity, the new units are of practically the same general design as the old ones.

Turbine-driven exciter.—The excitation current for the original station was furnished by two 100-kw. induction motor-driven exciters, and three 50-kw. exciters mounted on the shafts of the main units. The motor-driven exciters were used for normal operation, and the shaft-driven ones for emergency use in case of complete shut-down of the station or other causes.

Additional exciter capacity had to be provided for the increased capacity of the station. This was accomplished by the installation of a 275-kw. turbine-driven exciter. This is a unit complete in itself and supplied with water from a 40-inch connection to two of the 12-foot penstocks. Valves were installed so that the unit can be supplied with water from either main penstock. The installation of this unit provides a main source of excitation for the station that is complete in itself and can not be affected by any other trouble that might develop in the station.

Control board.—The extension of the control board was carried out along lines similar to those of the original equipment. One exciter panel and three generator control panels were installed. The rheostat equipment on the old section of the board was rearranged and other changes of detail were made to conform to the new section of the board. Voltage regulator equipment was rebuilt, and adapted to the new equipment. Advantage was taken of the opportunity offered while this work was being done to make changes in minor details of the control board which improved the general operating characteristics of the station.

Switch gear and station bus.—This station was originally designed and operated at 2,200 volts, all the switch gear and bus equipment being standard for that operating voltage. Changing the station over to the increased bus or operating voltage of 6,600, required practically the complete reconstruction of all this equipment.

Auto-transformers were installed in the basement storeroom, and generator leads were connected direct to the same. These transformers increased the voltage of the old units to 6,600 volts, and for all practical purposes can be considered as an added part to the old generators, as no provision was made for future operation of these machines without the auto-transformers. The 6,600-volt leads from transformers were carried to the station bus through main and auxiliary bus switches. Changes were made to the old 2,200-volt bus and the structure was extended on through the new section of the building. The 2,200-volt outgoing feeder equipment was formerly located in the old section of the building. In making these changes, the outgoing 6,600-volt feeder equipment was installed in the new section of the building. This new 6,600-volt equipment being of an entirely different type, it was necessary to construct a complete set of new type switch compartments, and slightly different bus layout; the old 2,200-volt outgoing feeder equipment being completely removed and diverted to other uses in the substations.

The reconstructing of switch gear and bus layout in this station was the most difficult detail to accomplish as the station had to be kept in continuous service while work was going on. Another factor that still further complicated the problem as a whole was that the raising of bus-voltage at the hydroelectric station necessitated corresponding changes being made at the Gatun substation, where power from the generating station is fed into the 44,000-volt transmission system. The work at the hydro station and at the substation had to be carried forward together so that the final change-over from 2,200 to 6,600 volts could be effected without interruption in service on any part of the power system.

Changes at Substation

The work at the Gatun substation which had to be done on account of these changes was the rearrangement of switch gear, installation of new type

feeder equipment for incoming 6,600-volt feeders, and installation of 2,200-volt bus with power transformer equipment for handling local distribution of power from the main 6,600-volt bus. This included the power distribution to Gatun Locks, which had formerly been supplied direct from the 2,200-volt station bus at the hydro station. A new 8,400-kw., 6,600/44,000-volt transformer was installed at the hydro station and the two original 4,000-kw. transformers that had been operating on the 2,000-volt bus were reconnected and placed in service at 6,600 volts. This work as a whole necessitated many changes in the general layout and details of this substation.

The Shift in Voltage

The actual change over from 2,200-volt bus voltage at the hydro station to that of 6,600 volts was accomplished without interruption in service on any part of the power system. This was done by carrying the work out in what might be called two stages. The first was the completion of the 6,600-volt bus structure and feeder equipment in both hydro and substation, and the installation of the new generating unit and 8,000-kw. transformer in the substation. When this work was completed the new generating unit was given a preliminary test by picking up the Balboa dry dock pump load through an 8,400-kw. transformer and over the spare transmission line. This load was carried for several hours, and final adjustments were made on the new equipment. The new unit was then tied into the power system and operated in parallel with the old 2,200-volt generators through the 44,000-volt bus in Gatun substation. The station was then operated with this lineup for about a week in order to make necessary adjustments to the new equipment. When the satisfactory operation of this new equipment was assured, work was then started on changing over the old 2,200-volt generators, so that they could operate in parallel with the new unit of the 6,600-volt bus.

The changing over of old units was the second, or final stage of this work. One unit at a time was taken out of service. The generator leads were opened up and brought through the auto-transformer to the isolated section of the main bus which was being reconstructed for 6,600-volt service. The old 2,200-volt generator switching equipment had to be replaced with equipment of a different type, which necessitated demolishing the old concrete switch cells and replacing them with new ones of a different design in the same location. The two switch cells and the instrument transformer compartment for each unit were built several months in advance and the greater part of the preliminary work was done. When the old switch structure was demolished this new structure was set in place by an overhead crane, leveled up, and the switches were installed. This method eliminated the time required to build intricate wooded forms, and the setting of concrete after being poured. After the erection of switches and bus structure of each unit was completed, final connection of its section of bus was made to the new 6,600-volt section, and the old unit was placed in parallel on this bus with the new unit. In the meantime the work at the Gatun substation was carried on and changes were made in accordance with the status of work at the hydro station.

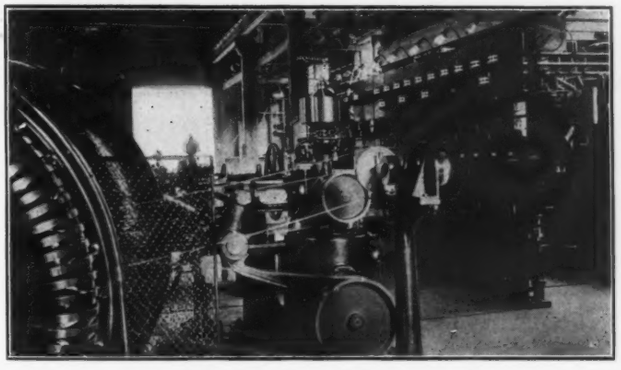
The work as a whole was completed during November, 1918. With the exception of minor adjustments to equipment, the station has been in satisfactory operation ever since.

THE TEMPORARY POWER PLANT AT HETCH HETCHY

BY RUDOLPH W. VAN NORDEN

(Recent developments in the Hetch Hetchy project have focused attention on the development of power. Several main power stations will form parts of the completed system, but as yet the only power actually developed is that at the temporary station at Early Intake here described. The author of this brief description was at one time connected with the city engineer's office at San Francisco and is intimately familiar with the work—The Editor.)

In the spring of 1917, work was commenced on a temporary power plant for the Hetch Hetchy system, located just below the Early Intake. This plant, which is for the purpose of furnishing power for construction work at all points in the mountain



Interior view of the temporary power plant in Hetch Hetchy. The plant is equipped with three generating units of 800 kva. each.

section of the San Francisco water and power project, is equipped with three generating units of 800 kva. each, and a total output of 2750 hp. The generator current is stepped up to 22,000 volts, for transmission to the points of use. A diversion, consisting of a low concrete dam, was made in Cherry Creek about 2.5 miles above its junction with the Tuolumne, and a conduit 3.5 miles long following the east bank of the Cherry and then the north bank of the Tuolumne, was built. This conduit has 4400 ft. in tunnels and 1.4 miles of concrete lined canal, and 1.3 miles of timber flume. A 42-in. riveted steel penstock, 530 ft. long, branching into three 28-in. pipes, which reduce to 24 in. at the turbines, supplies water to the three units. The head, including draft of the turbines, is 346.5 ft. Francis type turbines, built by the Pelton Water Wheel Company, are installed, Pelton governors, General Electric generators and four 1000-kva. Westinghouse raising transformers. The power house building is of timber frame construction, sheathed with asbestos covered corrugated iron. This is a temporary installation but substantially constructed. It was placed in operation in the spring of 1918.

California 220,000-v.--1100-mi.--1,500,000 kw. Transmission Bus

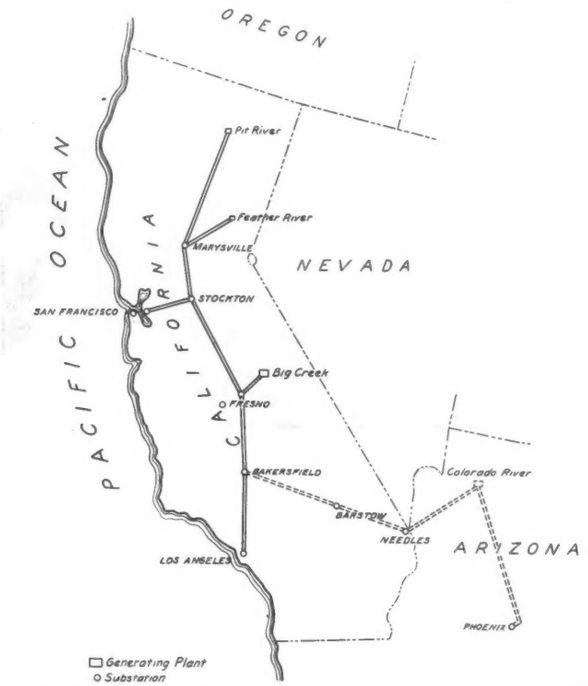
BY R. W. SORENSON, H. H. COX AND G. E. ARMSTRONG

(Interconnection between the lines of the Pacific Gas & Electric Company and the San Joaquin Light & Power Company is significant of the movement towards general interconnection which is actively afoot in the West. The present water shortage and the need for conservation of fuel make the following state-wide plan for more efficient power-distribution one of immediate practical importance. The authors are respectively, Professor of Electrical Engineering at Throop College of Technology, Station Chief of Eagle Rock Station and member of the Department of Generation, Southern California Edison Company. This paper is one of the important contributions to be offered at the Pacific Coast A. I. E. E. convention of Sept. 17-19, at Los Angeles, Cal.—The Editor.)

Fuels, particularly oil, must soon be used for isolated power only in places where electric power is not available, as in the propelling of air and ocean craft. In large power systems, especially in the West, the use must be limited to standby service, for peak loads, low water periods, and other emergencies.

Power Resources

California has available ample hydro-electric power to supply the industrial and agricultural demand for many years.



Map showing the proposed transmission system based on an interconnection of all the California power companies, and extending for a distance of 570 miles.

Small developments aggregating 325,000 kw. have been completed and many others of this type are available. There are also four large projects as indicated in Table I which can be readily developed to a capacity of 1,500,000 kw. in the near future.

TABLE I
Large Power Resources

	New Developed and Under Construction	Proposed Developments 1926	Reasonable Future Development (not ultimate capacity)
	Kw.	Kw.	Kw.
Pit River	None	200,000	500,000
Feather River	100,000	200,000	300,000
Colorado River	None	None	200,000
Big Creek	100,000	300,000	500,000
Total,	200,000	700,000	1,500,000

Total 1926 hydroelectric power development including small projects, 1,025,000 kw.

The data for the tables given here of resources and loads, of the northern part of the state, is taken from the various reports which have been published, and no attempt has been made to verify it.

Load Demand

The best available information indicates a demand in 1926 approximately as shown in Table II.

TABLE II

1.	Sacramento Valley, northern portion	70,000 kw.
2.	Truckee River electrification	40,000 "
3.	Sacramento Valley, southern portion	125,000 "
4.	San Francisco Bay district	250,000 "
5.	Fresno district	90,000 "
6.	Bakersfield district, including Tehachapi electrification	125,000 "
7.	Los Angeles district	300,000 "
8.	Barstow and Needles district, including railroad electrification	40,000 "
	Making a total of	1,040,000 kw.

In order to carry this load, approximately 500,000 kw. additional in hydroelectric capacity will be required.

A demand for power such as is shown in Table II can be supplied most economically by power developed in large units. Large power units require transmission lines of the highest possible economic voltage.

*It has been shown that for long transmission 220,000 volts is economical under conditions which require a much more expensive construction than has proven adequate for the 150,000-volt lines of the Southern California Edison Company.

California Transmission Bus

On this basis a plan as shown on the map of Figure 1 is proposed. In this plan the interconnection of all the California power companies has been assumed, as an economic necessity for its best utilization. Interconnections of limited capacity are not entirely satisfactory because they fail just at the time they are needed most to transfer from one system to another large blocks of power.

The plan of the proposed scheme involves the construction of a two-circuit transmission system extending from Pit River to Los Angeles, a distance of 570 miles. Branch lines of like voltage connect the three other power projects and the San Francisco load center to this main line on which the other load centers are located. The main line thus becomes a high tension bus extending nearly the entire length of the state, hence its name: California Transmission Bus. This arrangement makes possible unlimited interconnection and exchange between all the power companies of the state.

*Silver—"Problems of 220-kv. Power Transmission," A. I. E. E. Proceedings, June, 1919.

Substations have been located at Marysville, Stockton, San Francisco, Fresno, Bakersfield, and Los Angeles. These points are natural load centers and suitable points for connecting with the present power systems. On the Colorado River branch, the construction of which is dependent upon the electrification of the transcontinental railroads, substations would probably be located at Barstow and Needles. The substations divide the lines into sections of suitable length for practical operation, the longest section being 150 miles, as shown in Table III.

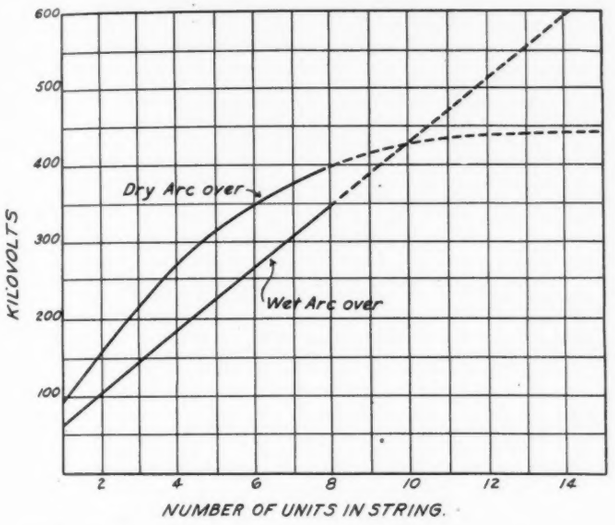


FIG. 2. TYPICAL 60 CYCLE ARC-OVER CHARACTERISTICS. SUSPENSION INSULATORS.

These curves show no practical gain in dry arc-over voltage for strings of more than ten units

TABLE III

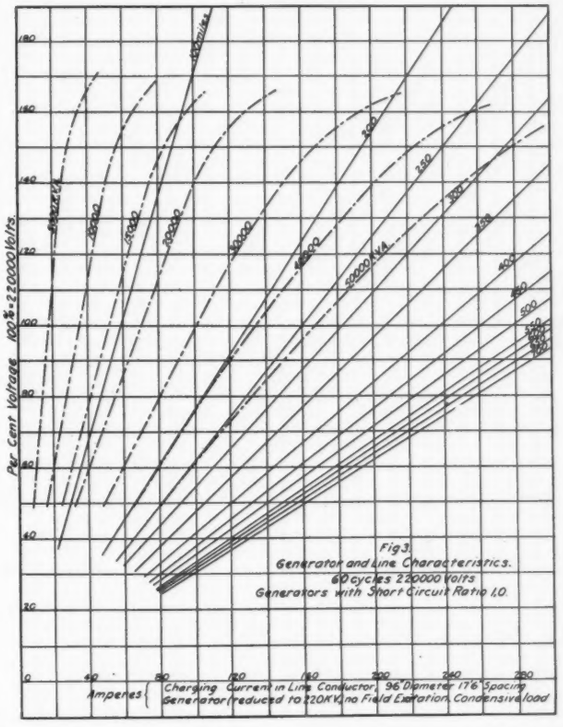
Pit River to Marysville	150	miles
Feather River to Marysville	60	"
Marysville to Stockton	90	"
Stockton to San Francisco	60	"
Stockton to Fresno	130	"
Big Creek to Fresno	40	"
Fresno to Bakersfield	100	"
Bakersfield to Los Angeles	100	"
Bakersfield to Barstow	110	"
Barstow to Needles	150	"
Needles to Colorado River	100	"
Colorado River to Phoenix	100	"
Pit River to San Francisco	300	miles
Big Creek to Los Angeles	240	"
Big Creek to San Francisco	230	"

The Transmission Line

The standard frequency, 60 cycles, has been assumed on the basis that the Southern California power systems operating at 50 cycles will ultimately find it advantageous to conform to the A. I. E. E. standard. In the natural growth of the load as shown in Table II, 70 per cent of the 1926 load will be supplied by the 60 cycle systems. Interconnection of such large load centers or power sources through frequency changers, limits the exchange of power, is uneconomical, and increases tremendously the required operating vigilance.

The practicability of the high voltage line has been well demonstrated by over five years of remarkably successful operation of the 150,000-volt lines of the Southern California Edison Company, which, during this period, have delivered from the Big Creek power houses over the 240-mile lines to the Los Angeles distribution systems, 1,200,000,000 kw-hrs. at an average efficiency of 87.5 per cent with a 45 per cent load factor. During this period there have been no interruptions for which the high voltage is responsible, and on the contrary, the system has been free from disturbance and interruption to a greater degree than the lower voltage lines in the same locality.

The present Big Creek lines can be operated at 220,000 volts, 60 cycles, without material change, and this is proposed as a link of the transmission bus, and its operation under these conditions will be analyzed and applied to conditions of the proposed system.


Per Cent Voltage 100% = 220000 Volts
Fig 3.
Generator and Line Characteristics.
60 cycles 220000 Volts
Generators with Short Circuit Ratio 1.0.
Amperes
Charging Current in Line Conductor 96" Diameter 176" Spacing
Generator reduced to 220 KV. no Field Excitation. Condensive load

With 50,000 kva. of generating capacity connected to a line of 250 miles the line can be charged without losing control of the voltage with generators with a short circuit ratio of 1.0.

Analysis of Big Creek System

Corona —

As now operated at 150,000 volts and 50 cycles, the voltage is only 80 per cent of the lowest critical voltage of any part of the line and there is no corona loss. At 220,000 volts, 60 cycles, corona loss occurs to some extent on the entire line but amounts to but 0.4 per cent of the line capacity during fair weather. With storm conditions over the entire line, and with an assumed reduction of 20 per cent in the critical voltage, the corona loss would be 8 per cent of the line capacity. This loss is not sufficient to make the line inoperative and would occur too rarely to be an economic factor.

Insulation —

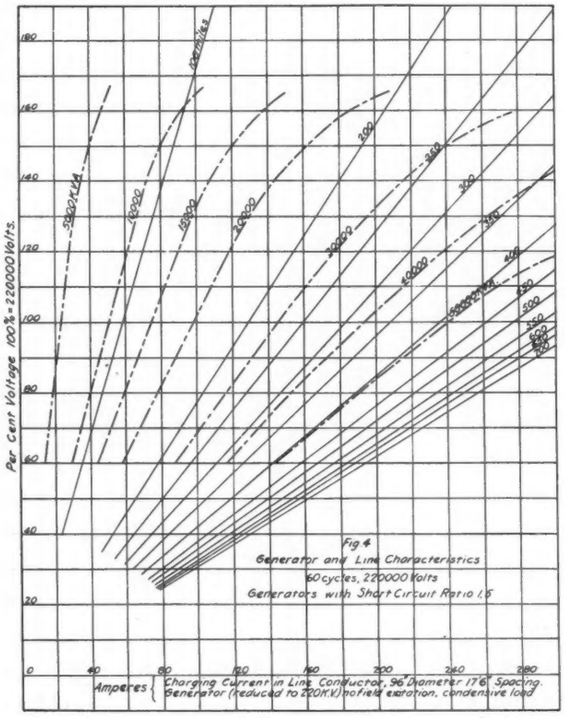
The Big Creek 159,000-volt lines have nine units in each suspension string and two eleven-unit strings in parallel on dead ends. During the five and one-half years of operation only two insulator string failures have occurred. Both of these were during normal conditions of operation without any apparent cause, other than that of being in a location where the insulators have been found to have a relatively high rate of deterioration.

The Big Creek line towers allow sufficient clearance to permit the lengthening of the nine unit suspension strings to eleven units, and to any desired number of units at dead ends. Table IV shows safety factors for insulator strings, wet and dry.

TABLE IV
Safety Factors for Insulator Strings

		Wet arc-over 9 Unit String	Wet arc-over 11 Unit String	Dry arc-over 9 Unit String	Dry arc-over 11 Unit String
(87 kv. to ground)	150 kv.....	4.3		4.8	
(127 kv. to ground)	220 kv.....		3.7	3.3	3.4

The Big Creek line operated at 220,000 volts is at the critical corona voltage and any disturbances resulting in a higher voltage will quickly expend their energy in producing corona loss, which will permit a smaller safety factor to be used.



The point of intersection of the generator curves with the line charging current curve for any particular line determines the voltage to which the generator will build up when connected to that length of line with no field excitation.

Figure 2, curves showing arc-over voltage as reproduced from Mr. Silver's paper, "Problems of 220-kv. Power Transmission," show no practical gain in dry arc-over voltage for strings of more than ten units and with these facts in view, it is proposed that for operating the Big Creek line at 220,000 volts, suspension strings have 11 units and dead end strings 12 units in series. Insulator testing crews have several times reported four and five defective units in a nine-unit suspension string, without any indication of trouble. The only apparent value of a longer string than that proposed would be a decreased probability of sufficient defective units in a string to cause breakdown. Developments of methods of grading insulator units and shielding insulator strings will, in all probability, materially change curves of Figure 2.

Present day methods of insulator testing and maintenance would probably have prevented the two failures which have occurred on the Big Creek lines as previously mentioned. These methods applied to the lines operating at 220,000 volts, and the use of the better types of insulators now available, will insure successful operation.

Charging Current —

Long high voltage lines cannot be operated without synchronous condensers at the receiving station to regulate the voltage, and as a consequence the charging current, even at the standard 60-cycle frequency, becomes a factor of no great importance as long as these synchronous condensers are connected to the line.

Without these condensers the line charging current must be furnished entirely by the generators, in which case the generators may become greatly overloaded and at the same time produce a very high voltage over which the operator has no control. To avoid this emergency a transmission line with its generators, transformers, and synchronous condenser must be considered as a unit and as such should be securely coupled together electrically at all times. This has been proven practical in the case of the Big Creek system in which it is possible to start the 15,000-kva. condensers and bring them up to speed with the generators.

Line Capacity —

The Big Creek lines as operated at 150,000 volts with 30,000-kva. condenser capacity per line at the receiver end are each good for 57,500 kw. at 85 per cent power factor, and will have under these conditions a line drop of eleven per cent.

Operated at 220,000 volts these lines should each have a capacity of 125,000 kw. with an equal line drop when provided with the proper condenser capacity, which is approximately 75 per cent of the line capacity in kilowatts.

This is a fair indication of the conditions which will exist in the proposed system, the load centers of which are so distributed as to limit the actual average distance of transmission to about 200 miles. The economic gain in doubling the capacity of lines which cost approximately $6,000,000, the present cost of which would be at least 30 per cent more, would more than offset the cost of all necessary changes, including the adoption of the standard frequency.

Mechanical —

The type of construction used on the Big Creek line has proven entirely adequate for California conditions. There have been only three mechanical failures, all of which occurred shortly after the line went into service and were all due to defective line hardware. In one case the failure was due to faulty design. This fault was entirely corrected by re-designing the cable clamp so as to grip the steel core independently of the aluminum conductor. The other two were due to individual defects in parts. There have been no tower failures, and no tower maintenance whatever has been required. Approximately twenty per cent of the Big Creek line is subject to ice and snow conditions, parts of it reaching altitudes of 5000 feet. Similar conditions exist over practically the entire proposed 220,000-volt system.

Operation —

The most interesting feature of the operation of the Big Creek system is its reliability, which has been equal to that of steam plants of similar capacity located near load centers. Flashovers have caused only momentary interruptions and have in no case resulted in damage such as to prevent immediate resumption of service. During the greater part of the time the power has been carried over a single line for a large part of the distance.

The operating history of the Big Creek system discloses no evidence of any trouble due to the high voltage of the system, and in addition has demonstrated that higher voltages may be used with equal or greater reliability. The Big Creek 17,500-kva. generators have operated at 60 cycles satisfactorily and delivered full output at this frequency.

High tension line switching and synchronizing has been carried on consistently throughout the operation of the Big Creek system without trouble, and should be possible on the 220,000-volt system. During times of switching slight dis-

charges, never followed by any energy current, occur on the arresters. Operating at corona voltage rather than at 80 per cent of the critical voltage, it may be possible to absorb these disturbances without arresters.

Complete parallel operation of all lines must be adhered to in the proposed system. Satisfactory protective relay systems for dropping defective sections with little disturbance have been developed for present parallel transmission lines and there appear to be no obstacles to extending these to the higher voltages.

Generators*—

Curves of Figures 3 and 4 show generator and line characteristics for 60-cycle, 220,000-volt systems. The full lines are the charging currents in amperes for different lengths of line plotted against per cent normal voltage. The broken lines are generator characteristics of various sizes of generators when connected to condensive loads with no field excitation. The point of intersection of the generator curves with the line charging current curve for any particular length of line determines the voltage to which the generator will build up when connected to that length of line with no field excitation. Figure 3 is for generators with a short circuit ratio of 1.0 while Figure 4 is for those with a ratio of 1.5.

Figure 3 shows that with 50,000 kva. of generating capacity connected to a line of 250 miles, the line can be charged without losing control of the voltage with generators of this design. By having synchronous condensers connected to the line at the receiving station generators of this capacity will bring up any length of line necessary to the successful operation of the proposed system. Those curves show that generators for such a system should be designed with the highest short circuit ratio that other conditions will permit, in order to reduce to a minimum the tendency to become self-exciting.

Comparative Data —

	Big Creek Lines at 150-kv.	220-kv. Lines as proposed by Silver
Aluminum Steel Cable		
Diameter	.95 in.	1.036 in.
Circular mils	683000	808900
Weight per foot	.75 lb.	.90 lb.
Length of average span	750 ft.	800 ft.
Weight of towers without footings		
Suspension	4300	9000 to 14000
Anchor	6450	24000
Stringing tension at 80° F.		
No ice allowance	4740	
Ice allowance	3130	
Maximum tension allowed	8500	17300
Insulator strings to carry load		
Suspension	1	2 and 3
Anchor	2	6

For further data regarding the Big Creek line refer to the paper, "150,000 Transmission System," by Woodbury, A. I. E. E. Trans., 1914.

Immediate Action Needed

Such a system as proposed is needed immediately; all engineering fundamentals essential to a solution of its problems are well understood, and the Big Creek system can be used as a part of the project without material reconstruction.

To supply this need, arrangements should be made without delay for a complete working out of all details of the proposed system, as otherwise in the future it may be necessary to do a large amount of reconstruction to bring together individually designed systems, which is never a wholly satisfactory procedure.

*Data for these curves was worked out in the laboratory of Throop College of Technology in 1915 and results verified by actual tests on the 17,500-kva. generators at Big Creek. For further data and explanation of generator performance with large condensive loads, see Newbury Electric Journal, 1918.

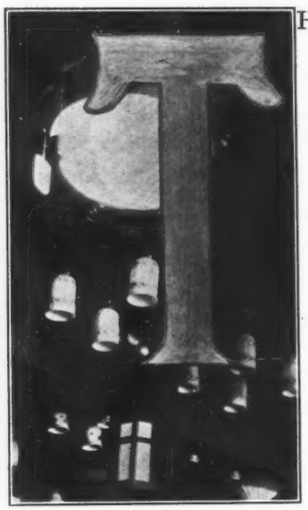
HELPFUL SUGGESTIONS FOR TECHNICAL WRITERS

In order to avoid confusion in the use of abbreviations in technical writing the following suggestions for standardization are given, as illustrating the practice of the Journal of Electricity. These excellent suggestions are compiled with certain modifications from requirements of the meetings and papers committee and of the editing committee of the American Institute of Electrical Engineers. They are now practically universally recognized as standards of good practice for technical writers.

Name	Abbreviation
Alternating current	spell out, or a.c. when used as compound adjective
Amperes	spell out
British thermal units	B.t.u.
Candle power	c.p.
Centigrade	cent.
Centimeters	cm.
Circular mils	cir. mils
Counter electromotive force	counter e.m.f.
Cubic	cu.
Diameter	spell out
Direct current	spell out, or d.c. when used as compound adjective.
Electromotive force	e.m.f.
Fahrenheit	Fahr.
Feet	ft.
Foot-pounds	ft-lb.
Gallons	gal.
Grains	gr.
Grams	g.
Gram-calories	g-cal.
High-pressure cylinder	spell out
Horsepower	hp.
Horsepower years	hp-yr.
Hours	hr.
Inches	in.
Kilogram	kg.
Kilogram-meters	kg-m.
Kilogram-calories	kg.cal.
Kilometers	km.
Kilovolts	kv.
Kilovolt-amperes	kva.
Kilowatts	kw.
Kilowatt-hours	kw-hr.
Kilowatt-years	kw-yr.
Magnetomotive force	m.m.f.
Mean effective pressure	spell out
Miles	mi.
Miles per hour per second	mi. per hr. per sec.
Millimeters	mm.
Milligrams	mg.
Minutes	min.
Meters	m.
Meter-kilograms	m-kg.
Microfarad	spell out
Ohms	spell out
Per	spell out
Percentage	per cent, (or % in tabular matter)
Pounds	lb.
Power factor	spell out
Revolutions per minute	rev. per min. (or r.p.m. in tabular matter)
Seconds	sec.
Square	sq.
Square-root-of-mean-square	effective, or r.m.s.
Ton-mile	spell out
Tons	spell out
Volts	spell out
Volt-amperes	spell out
Watts	spell out
Watt-hours	watt-hr.
Watts per candle power	watts per c.p.
Yards	yd.

Distinction and System in the Retail Busines

(Remarkably pleasing effects in store arrangement are often achieved by very simple devices, such as the mirrors and curtains described below. In addition to distinctive arrangement, the owner of this enterprising store advocates careful and detailed handling of all labor and material expenses, on the theory that methodical organization is one of the essentials of success in electrical retailing.—The Editor.)



Ceiling arrangement showing fixtures set off against short green burlap curtains.

THAT there is a right way and a wrong way of doing things, and that it pays to do things right, is the belief of R. S. Willoughby of the Silver State Electric Company, Denver, Colo. Ample evidence of this is found in the arrangement and fixtures of the store, and in the methods that are followed for charging proper expenses of labor and material to a job under construction.

First Impressions —

The appearance of the display room is greatly enhanced by the use of mirrors on both sides of the room. These not only increase the effective size but add to the illumination.

Moreover, a customer examining a fixture close at hand is afforded a distance view at the same time by the reflection in the mirrors.

Immediately upon entering the display room the visitor becomes aware of a certain spaciousness and individuality. There is no sign of that crowded mass of metal and glass which is so often seen in the electrical retailer's store. The effect of roominess is maintained by the simple expedient of green burlap screens dropped from the ceiling at intervals between the fixtures. These provide an effective background which displays each fixture to its best advantage.

Listing Material —

Have you ever heard a conversation of this kind between a contractor and his wireman?—

"John, you finished up that job for Smith's Cafe, didn't you?"

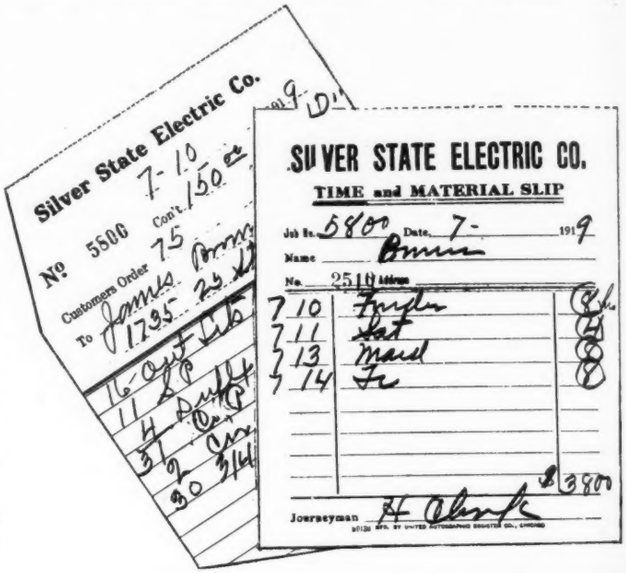
"Yes, I finished that day before yesterday."

"Well, I wish you'd turn in the list of material to the bookkeeper. This is the third of the month and the bills should have been sent out already."

So John makes out the list, holding up Anderson's rush order and using time which will later be charged to Anderson.

The easiest time to list material used is when it is taken from the shop. To insure its being listed at this time, the following system is used by the Silver State Electric Company:

The Original Entry Form is made out in duplicate, and is serially numbered; thus each job has a number. The original contains an estimate of the job, and goes to the shop to be used for shop record. On it must be entered the serial numbers and total costs of all time and material slips issued on this job number. The duplicate remains in the original entry book, and is used as a check on the ledger to insure against loss of the original while in the shop.



Time and Material Slips used by the Silver State Electric Company for keeping track of labor and material costs

The Material Slip is also serially numbered, to check against loss or misplacement, and is made out at the time the material is taken from the shop. It must show the job number of the original entry order.

The Time Slip is similar to the material slip, but has a different set of serial numbers. The serial number is used as a check to insure against loss or misplacement. The time slip is made out each day, if the workman is in the shop, and must state the number of the job on which the time should be charged. No time is allowed otherwise.

Bookkeeping Methods —

As stated above, the serial number of each time and material slip, together with total costs, is entered on the original entry order; a circle is made around the value on the time slip and the slips are filed serially. The original entry order then goes back to the bookkeeper, as soon as a job is completed, and is entered on the ledger. The total cost of the job, allowing for overhead and profit, is also entered on the original form. As the estimated or contract price also appears, a discrepancy between them is easily found and any deficit is shown in red.

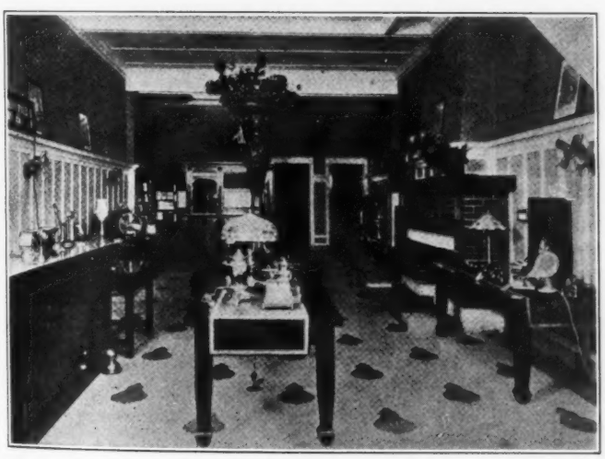
A separate slip is made out in red for all material returned from a job.

Western Ideas

SYSTEMATIC DISPLAY OF MERCHANDISE is a selling factor which a number of dealers neglect, to their own disadvantage. It is frequently the case that certain goods after being purchased are stowed away in some corner, and half forgotten. Unless a customer happens to ask for them they are completely overlooked, but it is an established fact that the customer when in search of a particular article is most likely to go to a store where he has seen it displayed in the window. The dealer who has the article in stock and has neglected to display it loses a possible customer and drives trade to the door of his competitors.

An article in "The Electrical Trade" suggests that the entire stock be divided into twelve general sections and a selected display made of one section each month. This systematic plan of rotation will prevent the losses resulting from accumulated unadvertised stock and will increase the dealer's profits in proportion. It is suggested in addition that to each week in the year be assigned the task of making a special drive on a particular class of goods, advertising them in the newspapers and displaying them in the windows.

A STORE WITH A HOME ATMOSPHERE and artistic furnishings is something which appeals strongly to women shoppers, according to a certain well-known milliner. In her establishment the reception room is provided with a library table, comfortable chairs, a divan, large bronze bowls of flowers, and artistic hangings of soft greys and blues, with a touch of rose. There are no show cases and the hats are not on display. The whole effect is of something very exceptional and exclusive and the psychological effect upon customers, and upon the community's rating of the establishment, is very marked.



There is no reason why an electrical store should be so uncomfortable that women shoppers hurry through their business with it. An electrical store can be made just as attractive as a millinery establishment.

A modified form of this idea can very well be worked out to advantage by electrical dealers. A store interior arranged like a room and provided with comfortable and artistic furniture, carefully arranged lamps and lighting fixtures, and the minimum display of other goods—such a plan has great possibilities for the electrical dealer, and would have a distinct appeal to women buyers. Most of these, at present, regard an electrical store as a jumble of incomprehensible fixtures and appliances, where they occasionally go to purchase some necessity. For many women shopping is a pleasure trip as well as a part of the day's business, but we have yet to meet the woman who enjoys buying a new electric lamp. It is not improbable that the atmosphere of the stores has much to do with this.

SYSTEM IN ORGANIZATION FINANCES is the message of this card distributed by the San Francisco Electrical Development League. All secretaries and treasurers know the vast amount of time and energy expended in the collection of dues, and the tendency of the human animal to forget or ignore the requirements of by-laws which are so seldom brought to their notice. By transferring this one from the obscurity of the archives to the broad daylight of a forcefully-worded, freely distributed card, the organization does away with all excuse for laxity in payment of dues, and incidentally saves the secretary and treasurer a vast amount of trouble.

YOUR ATTENTION, PLEASE!

The following amendment to the By-laws of the San Francisco Electrical Development League is now effective:

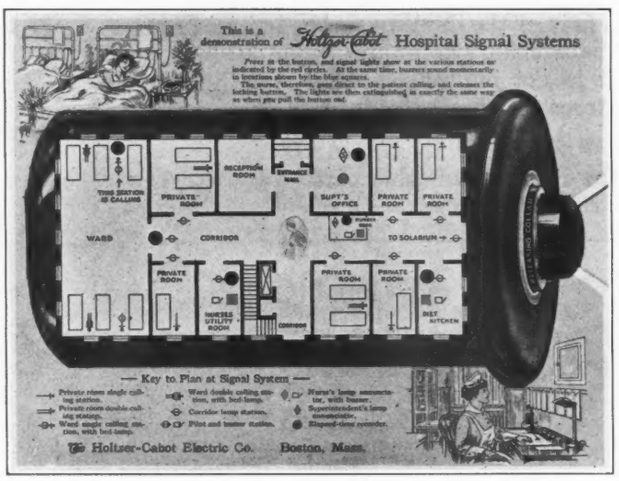
"If the dues of any member are not paid within fifteen days from the date at which they become due, he shall be notified by the Secretary that he is in arrears, and if not paid within fifteen days from the date of such notice his name shall be posted in the room where weekly meetings are held; if still unpaid after thirty days' posting, the member shall be automatically suspended."

LET'S KEEP THE SLATE CLEAN

A labor-saving device for secretaries and treasurers who are generally the only people in an organization who know anything about the By-laws.

FOR ATTACHING WINDOW DISPLAYS to the inside of a window glass, one company sends out small pieces of adhesive plaster which are pasted over the holes in the display. One of the great drawbacks to the use of the brightly-colored and attractive displays issued by manufacturers has been the difficulty of placing them satisfactorily in the windows. If they are propped up from behind they tend to slide down to a rakish angle or fall forward with broken backs. Every draught tends to upset them. If, on the other hand, they are affixed to the window glass in the usual way, by means of strips of gummed paper, the effect is extremely untidy and unsatisfactory. The new method does away with the protruding pieces of paper and keeps the display firmly against the glass without the means of support being visible, and without the necessity of marring the face of the picture by the application of paste. The holes in the display, for the affixing of the adhesive, can be so arranged that they are merged on the design and not apparent.

AN EFFECTIVE ADVERTISING CARD is that recently sent out by the Holtzer-Cabot Electric Company to describe a hospital signal system. The original of the illustration is a double card with a movable slip inside, and perforations at the points representing the various stations. When the projecting piece of card representing the button is



A double card which illustrates graphically the effect of pushing a button. The inner slip is so colored that brilliant red spots appear under the perforation when the signal button is pressed.

pushed it moves the inside slip and brings red spots under the perforations to represent the simultaneous flashing on of the signal lights at these various points. In the center is the nurse on duty hurrying to respond to the call, and in one corner the patient who is pressing the button. The plan of the system itself is contained, as the illustration shows, within the outline of the bell-push, and the whole card is executed in bright and effective colors. The little movable device is a very successful medium by which to demonstrate the operation of the system, and achieves its object far better than an ordinary one-piece descriptive card could have done.

TO INCREASE TRADE during the dull summer months a certain stationer conceived what proved to be a very successful idea. In the Sunday papers he made an announcement that, beginning Monday morning, he would circularize the town with fliers to advertise a special sale in every line of goods carried. On ten of these fliers, some one article, usually priced at $2 or more, would be priced at 25 cents. All these ten articles were to be different, and the fortunate holders of the special fliers might purchase any one of the specially priced articles by presenting the flier and twenty-five cents. The result of this notion was that most of the leftovers were promptly disposed of, and a brisk sale of other goods was carried on. The moral of this is not merely that all the world loves a bargain but that all the world loves a lottery, and ten startling bargains will draw particular attention to a sale which would otherwise have only the ordinary attraction of "reduced prices." The idea of heralding the fliers by means of a newspaper is another good notion. An unannounced leaflet with no special credentials usually finds its way very promptly to the fire or the waste basket.

MOVING THINGS ABOUT in your store is one way of avoiding dead accumulations. It is not only the housewife who during spring cleaning discovers a forgotten article under the piano or behind the book case; the storekeeper who keeps his goods in the same place and on the same shelf all the year round is liable to bring to light the most unexpected things—things he never dreamed he had—when he begins rearranging his stock. There is another disadvantage in a hard and fast arrangement of goods; customers get into the habit of walking up to that part of the counter where the particular article they want is stocked, so that the rest of the store display is wasted on them. A change in arrangement would cause them to stop and notice other articles which they did not know they wanted until they saw them. Shuffle the stock at spring-cleaning time and do not let the arrangement become so familiar to the purchaser that the individual articles no longer arrest his attention but affect him as part of the general scenery.

Successful merchandising is largely dependent upon effective window displays. Here is an example of what can be done with something so apparently prosaic and non-decorative as wire. A more discouraging subject for the artistic imagination to work with could hardly be conceived, yet by an ingenious symmetrical arrangement and a striking background, an eminently successful display is achieved. Note how the lighting adds to the effect.

California Electrical Co-operative Campaign

(Under the hands of a manager, in new offices, and with very definite plans ahead for the coming year, the California Electrical Cooperative Campaign enters upon a period of vigorous usefulness. The following items of the conditions and results of the work throughout the territory are indicative of the great interest being shown in this work, and of its concrete accomplishments in good feeling and in sales returns.—The Editor.)

New Location —

The Advisory Committee of the California Electrical Cooperative Campaign has established its new headquarters at 619 Call Building, San Francisco, with the new secretary, Captain Howard Angus, busily at work.

The new offices are conveniently arranged with two offices—one for the secretary and the other for the two field representatives in this part of the state, Curt C. Davis and William R. Brainerd.

The Campaign's offices are separate from those of the California Association of Contractors and Dealers and the San Francisco section of the Contractors and Dealers, who have established new offices at 641-643-645 Call Building. It will be noted, however, that all three organizations have offices on the same floor of the same building. The work of the California Electrical Cooperative Campaign is so closely associated with the California Association of Contractors and Dealers that it was deemed best to have the offices conveniently situated for the efficiency of the two offices and the convenience of the business men in the electrical world who have business relations with both.

All the plans of the Advisory Committee of the California Electrical Cooperative Campaign will be pushed more vigorously than ever, and new ways and means devised to better help the electrical industry in its service to the public. The consumer will be given more attention and the story of the cooperative efforts of all branches of the industry in his behalf told to him.

Captain Angus, as secretary, will give his full time to the following work, as outlined in a letter to the contributors by Lee H. Newbert, Chairman Advisory Committee:

Attend the meetings of the Advisory Committee and make proper record of its proceedings.

Analyze the weekly reports of field men and submit to the Committee, at its meetings, a digest of same for its information and consideration. (Analytical study of the reports requires more time than the Committee has at its disposal, other matters considered.)

Supplement by follow-up letters the work of the field men.

Prepare and send to all contributors a monthly report of progress of the Campaign.

Assist the Committee in preparing advertisements for central stations and attend to their distribution.

Cooperate with the Extension Division of the University of California in promoting a more extensive use of its courses among members of the electrical industry.

Address meetings of electrical organizations, architects, building contractors, improvement clubs, etc., on various phases of the electrical business.

Prepare booklets on the many uses and advantages of electricity for distribution by contractors and dealers and central stations.

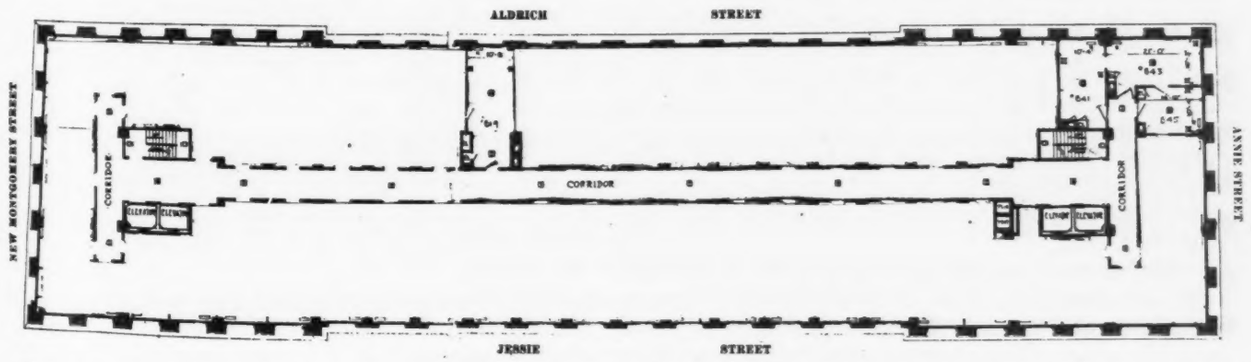
Prepare for the information of central station contributors reports of dealers' sales of appliances and motors, in order that they may have knowledge of the business secured through the efforts of dealers.

Solicitors in Demand —

The solicitor campaign has been so successful that the field representatives have a difficult time in supplying the demand.

The plan as outlined by the California Electrical Cooperative Campaign was to route the solicitors from one contractor-dealer to another as the requests came in. On paper the scheme was simple. In the actual working out of the plan, the field representatives soon found that the contractor-dealer refused as a general rule to give up the man sent to him. In other words, the practical lesson in soliciting, with its definite results, is being quickly learned.

But the field representatives find that solicitors are as hard to find as to keep. The present day result is that there are not enough to go around. The contractors and dealers are requested to be patient and their requests for solicitors will be filled as soon as the right men are secured.



Floor plan showing the new offices of the California Electrical Cooperative Campaign and the San Francisco Section of the Contractors and Dealers in the Call Building, San Francisco. The fact that the two organizations have their separate offices located near to each other on the same floor will be a distinct convenience not only to the organizations themselves but to those who have business with both.

Contractors and dealers should make a written application for solicitors to the office of the Advisory Committee and state whether they wish the man permanently or temporarily. This will greatly aid the work of the campaign. Each application will be given immediate attention.

The New Accounting System —

The field representatives of the California Electrical Cooperative Campaign are at present introducing to the contractors and dealers of the state the accounting system adopted by the National Contractors and Dealers' Association, National Association of Credit Men, and the National Electrical Credit Association.

As a general rule they have found the contractors and dealers of California quick to see the advantages of the system and ready to adopt it.

Mr. Brainerd has found the firms in the Sacramento and San Joaquin valleys deeply interested.

The Valley Electric Supply Company of Fresno have installed the system and are keeping their books open for the inspection of the other dealers of that city and near-by cities. The Shasta Electric Company at Redding have also adopted the system. The Dinuba Electric Works will install the system within the month. This store has just been purchased by J. M. Walsh and P. S. Briggs. James Northedge of Chico is also installing a system.

Many others have written checks for the accounting system and are now waiting for the delivery. Still more are considering the proposition favorably and will no doubt follow in the lead of the others.

Mr. Davis is at present busily explaining the system and taking orders in the bay counties. Robert King of the King's Electric Company in Oakland purchased the first set of Mr. Davis.

In Southern California Mr. A. L. Spring has just returned from his vacation and is explaining the advantages of the accounting system.

Campaign Notes —

The W. A. Cass Electric Store in Chico has moved on to the main business street of that city, and two weeks in the new location have brought a large increase in the business of the firm.

B. M. Kingsley opened a little shop last May in Corning, California, and began a wiring business. August finds him putting in a line of appliances and on his way to become an electrical merchant.

L. Edward Frank, manager of the Electric Motor and Machine Company, 4079 Stockton street, San Francisco, has made the discovery that fancy windows catch the eye of the people who live in apartments. He has had a run on three-pound irons and grills. These he has featured largely in his window displays. There is an art in finding out what people need and letting them know where they can fill their wants.

The Watts Electric Company recently opened its doors for the first time in Burlingame. Francis Watts, son of Frank Watts of the Watts Electric Company of San Francisco, is the manager. The store is located next to the principal motion picture theater in the town. Mr. Watts located where he did with a purpose. With his well-planned and well-lighted window displays he stops the theater-goers on the way to and from the pictures. Many come back the next day to buy. The interior of the store is artistically arranged with a cozy corner for the women and potted plants to add to the decorative feature.

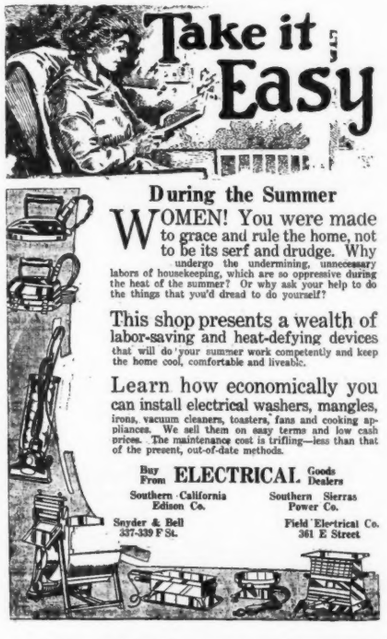
The San Jose Electric Company is the successor to the Gilbert Electric Company and is located at 38 West Santa Clara street, San Jose. The managers of the new company are Eugene Kuehnis and E. H. Snedaker. They intend to specialize in the merchandising of electrical appliances.

J. L. Thackeray, a veteran of the late war, has the progressive spirit. On his return to Red Bluff, California, he turned his old bicycle shop into a new electrical store. Much of his time is spent in wiring, but he has put in a well rounded stock of appliances and intends to feature the merchandising end of the business. Mr. Hughes, of the Northern California Power Company, is giving Mr. Thackeray splendid cooperation and the electrical store promises to be a permanent one in Red Bluff.

Cooperative Advertising —

An interesting result of the work of the California Electrical Cooperative Campaign is shown in the advertisement here reproduced. This was one of a series of advertisements entered into on a cooperative basis by the central stations and electrical dealers of San Bernardino.

It illustrates strikingly the new feeling of comradeship between members of the electrical industry


Take it Easy
During the Summer
WOMEN! You were made to grace and rule the home, not to be its serf and drudge. Why undergo the undermining, unnecessary labors of housekeeping, which are so oppressive during the heat of the summer? Or why ask your help to do the things that you'd dread to do yourself?
This shop presents a wealth of labor-saving and heat-defying devices that will do your summer work competently and keep the home cool, comfortable and liveable.
Learn how economically you can install electrical washers, mangles, irons, vacuum cleaners, toasters, fans and cooking appliances. We sell them on easy terms and low cash prices. The maintenance cost is trifling—less than that of the present, out-of-date methods.
Buy From ELECTRICAL Goods Dealers
Southern California Edison Co.
Southern Sierras Power Co.
Snyder & Bell 337-339 F St.
Field Electrical Co. 361 E Street

A sample of cooperative advertising, and a striking example of the work which the California Electrical Cooperative Campaign is doing in getting the different branches of the industry to pull together.

that the California Electrical Cooperative Campaign has successfully engendered. Two years ago, the idea of the dealer in electrical goods joining hands with the central station in an advertising effort of this kind would have occasioned considerable sur-

prise. Today it is accepted as a matter of course, so accustomed have we become to thinking in terms of cooperation rather than of competition.

This is only a single instance. Its counterpart can be found in nearly every part of California. Happily, this desirable situation is becoming more general every day. The widening influence of the Campaign is becoming more and more apparent, and it is not too much to hope that the time is not far distant when the old feeling of mild antipathy, if not of positive antagonism, may be said to have been entirely dissipated.

Cooperation as a Bankable Asset

BY C. W. BANTA

(The bank stands ready to cooperate with its customers—in the recognition that it succeeds with their success. It is because the bank recognizes that this principle obtains in all departments of business that the existence of a cooperative spirit within any industry increases the credit standing of that field with the banks of its community. Not only is the way of the price cutter hard in the traveling, but moreover it is unsuccessful, as may be judged from this second article by the assistant cashier of the Wells Fargo Nevada National Bank.—The Editor.)

Let me illustrate the activity of the force of cooperation in everyday business matters: Charity should begin at home, therefore I shall start with banking.

Yesterday, banking was a business, credit was merchandise. If the borrower's needs were great, the interest rate was high—in fact, the price often made wreckage of the borrower. Any profit that could be taken by lawful force was legitimate. Today, banking is a profession, the same as medicine, or the law. More recently engineering, with its various branches, was added to the list of professions. Then came accounting; and the latest applicant has been that of insurance, with its various and tremendous problems, to insure the human race of its natural expectancies.

I suppose there was a time when a doctor held as stock in trade the secrets which he had learned regarding the functions of the human body, or the potency of drugs. Today, there are no secrets. The profession has been tremendously uplifted and the practice greatly improved because every discovery has been immediately disclosed to those who, by their education and inclination, were able to absorb the improved methods. Methods good for one physician are good for all, and that without detriment to any.

Today, banking is a profession. This implies that credits are no longer to be looked upon as financial merchandise; that profits are no longer to be regarded as gain to be taken from the individual customer. Profits are now to be derived solely as a bi-product, accruing without effort and without connivance, as a result of the faithful and efficient service that the bank affords to its clients.

I mean that the banker shall not say to himself, "I wonder how great a rate of interest I can charge this customer." Today, the rate of interest is standardized to yield the bank a fair profit. Every customer shall receive the same standard rate—all shall have equal opportunity to share the bank's facilities, so that there shall be no favored customers.

The bank is only as strong as its customers—it prospers, not as it is able to acquire more than a fair profit, but as its customers prosper. A banking institution's professional duty is to afford its clients the same kind of information regarding finance that a physician will supply his patient regarding medicine, or an attorney regarding law, or an engineer regarding the accomplishment of a great enterprise.

A bank should study each and every client. It should analyze that client's physical, mental, and moral equipment. It should persuade its client to analyze himself, and to seek the cooperation of his fellows in the upbuilding of a profitable and efficient business organization.

Mr. Retailer, Mr. Contractor—you need cooperation more than anyone. Of course, you know it; but do you FULLY realize that you, alone, must be purchasing agent, sales manager, office manager, collector, and financial manager, all in one? Your larger competitors can afford to employ a specialist on each kind of duty.

If you are a good salesman, are you a good credit man? If not, get your bank, or your jobber, or your competitor into the habit of informing you regarding credit matters, so that you can deal safely and without worry. Reciprocate the courtesy — make lifelong friendships with your competitors.

Have you financial problems? Demand cooperation. Get an analysis of these problems from your banker, from your auditor, from your lawyer. Ask for the cooperation of the financial man connected with your jobber. He will help you. The business world today stands ready to cooperate, to assist every honest man to succeed. It will supply information and advice, and even certain facilities that will help you toward success.

A business organization, like a nation, is a being in the same sense that we are humans. It has a day of birth, it goes through its childhood, it creates a history, its antecedents become a matter of record, its reputation commences to be handed from mouth to mouth, its character becomes firmly formed.

It struggles to maturity and success, or ekes out a penurious living, or fails and dies.

It has a character, the same as we humans. That character is the composite of the ability, personality, ethics, policies, activity, characteristics, of its executives. It is well balanced only to the extent that it is dominated throughout by the safest, the highest, the truest ideals. The greatest measure of usefulness would be obtained if 100% cooperation could be obtained, by a group of men who would each consider his specialty a profession—like medicine, surgery, law or engineering. Such is business today!

Standardization of Outlet Box Numbering

(An important step forward has been taken by the Electrical Outlet Box Section of the Associated Manufacturers of Electrical Supplies in the adoption of a uniform numbering system for outlet boxes. This does away with errors and will prove a great convenience to retailer and jobber alike. The reasons for taking the step and its advantages are concisely given in the following statement, of interest to all handling or using this type of material.—The Editor.)

Probably no one group of electrical manufacturers is more anxious to receive suggestions from their clientele than the group manufacturing outlet boxes. The evidence of this progressiveness is shown in the recent determined action taken by them in adopting a standardized system of numbering for outlet boxes and covers.

On October 11, 1916, the Electric Supply Jobbers' Association unanimously voted in favor of some method of eliminating seven sets of catalog numbers in order to eliminate seven almost identical lines of outlet box cover numbers. The manufacturers immediately followed up this suggestion, but due to war activities, were compelled to side-track their efforts. Now, however, endeavor has turned to actual accomplishment. New catalogs of those manufacturers will shortly be on the market bearing the new standardized catalog numbers. Hereafter the trade will have but one number to consider; substitute numbers and cross indexing will be eliminated. A catalog number will mean a certain definite box; this number applying to this same box made by every manufacturer.

The method adopted is simple and clear—no key to remember; no puzzles to clear up. As an evidence of this, the numbers have been so worked out that the first two numerals of the cover for a certain size and shape of box, will be the same as the first two numbers of the box itself. The box number will consist entirely of numerals. The cover will be designated by the insertion of the letter "C" after the first two numerals. The flush plate will be designated by the insertion of the letter "R" after the first two numerals.

Standardization is a saving all along the line, and is becoming universal. When the new catalogs are distributed, all of the electrical trade, from the manufacturer to the wireman, will feel this saving.

A few of the reasons for the standardization of box numbers follow:

1. There are at present approximately 1,500 different numbers used in designation of boxes and covers of various manufacturers. There are, however, less than 200 distinct types.

2. Each manufacturer now has his own system of numbering, although the use and general type of almost any box or cover is identical with that of several manufacturers.

3. Both contractors and jobbers, in placing orders, will rarely ever take the trouble to look up and use the numbers of the manufacturer with whom the order will be placed. This necessitates the editing of orders by either the jobber or manufacturer and must necessarily result in numerous errors. On orders received from contractors, the jobber will almost invariably substitute the numbers of such boxes as he may have in stock, if shipment is to be made from stock, for those specified in the order; or, in case direct factory shipment is to be made, forward the order as received to the manufacturer with whom he may be placing his box orders at that particular time. This is invariably done unless the purchaser insists upon the particular make of boxes specified.

4. The types and styles of boxes and covers have become so standardized as to be almost on the same basis as sizes of conduits; there is, therefore, no more reason why different numbers should be used to designate the same box as manufactured by different manufacturers than that different numbers should be used to designate the sizes of conduits.

5. With the various box manufacturers using separate numbering systems, it is now necessary for the device manufacturers to use as much space in listing the boxes or covers with which their receptacles, switches, attachment plugs, etc., may be used as to list the articles themselves. This is also applicable inversely; about as much space is used in the catalogs of the box manufacturers in listing the devices as in listing the boxes and covers themselves. Then, again, it is the almost universal custom of the various box manufacturers to list the corresponding numbers of competing manufacturers. To do this requires additional space.

6. For the box manufacturers to furnish the device manufacturers with the necessary data for a proper listing involves an enormous amount of detailed research work by the design, engineering and drafting departments of each; also voluminous correspondence. Errors are frequent. Both labor and errors could therefore be reduced to a minimum through a standardization of numbers.

7. For the various manufacturers to adopt a standard set of numbers would effect a considerable economy in catalog costs, and, in addition, reduce the volume of jobbers' catalogs. Take the sheets issued by the N. E. S. J. A.: separate sheets are now issued by this association, to show the lines of the several manufacturers. By the adoption of a standard set of numbers, these could be consolidated and one set of sheets used to show the lines of all manufacturers. This would reduce the volume of the association catalog by from 100 to 200 pages. Same would apply to the National Electrical Contractors' Association Data Sheets.

8. The reduction in the volume of sheets would be particularly appreciated by jobbers' salesmen, as it would considerably reduce the weight of the catalogs which they have to carry.

9. A jobber, in getting out a new catalog, would feel no hesitancy in listing a standard set of numbers, cuts, etc., for he could so list and place his orders with any manufacturer; at the present time jobbers are frequently carrying the listing of one manufacturer's line and furnishing boxes of some other manufacturer.

10. Separate numbering systems, as now used, give recognition to substitutes, which at best is a bad practice and not to be encouraged. If encouraged in one line, as at present in the outlet box line, leeway is allowed for substitution in all lines.

11. The adoption of a standard numbering system would prove educational to all in the electrical business, for contractors, salesmen, wiremen, clerks, etc., would soon become familiar with any system adopted and know that an XYZ box was a box of a particular type and for a certain use. With so many different numbers, as is now the case, this is impossible.

12. While some advantage might now accrue to the various manufacturers through familiarity of portions of the trade with their own "pet" numbers, the adoption of a standard set of numbers would prove reciprocal, and each manufacturer would benefit in about the same proportion.

13. The adoption of a standard set of numbers would in no way interfere with the various manufacturers playing up the strong points of their own lines, such as finish, detailed construction, materials used in manufacture, etc. As a matter of fact, these features could be emphasized more than is now possible. In ordering, the contractor, if he wanted a particular make of box, could specify by giving the name or brand and then list the standard numbers desired. As indicated in a previous paragraph, this would reduce substitution to a minimum, eliminate frequent errors, etc. If no particular brand was specified, the jobber would then understand that no preference existed, and could ship from his stock or place order for direct shipment with his preference of manufacturers.

Cracking of Pin Type Corner Porcelain Insulators

BY S. L. FOSTER

(The cracking of pin type corner porcelain insulators which is a troublesome problem on most power lines, seems to have been satisfactorily solved by the United Railroads of San Francisco by the adoption of a simple method of painting with shellac. The details of this experiment and the possible breadth of its application are here suggested by the chief electrician of that company, who is intimately familiar with the problem as it there presented itself.—The Editor.)

The United Railroads of San Francisco has been in the a.c. high tension insulator game for the past seventeen years in a modest but appreciable way, and has had its share of experiences with the local problems connected with the art. While the highest voltage worked with has only been 13,000 and the feature of progressive deterioration of insulation resistance has not bothered, under the salt fog conditions met with, the problems of burned-off wood pins, crossarms and pole tops, and of crooked insulators, have been very much in evidence among the 9000 insulators involved.

The literature on these subjects contained in the trade journals, Institute proceedings, etc., has been followed, and the writer thinks he has a little information that may be of interest to the craft.

Problems Which Have Been Solved

The problem of how to prevent burning of wood pins, crossarms and pole tops seems to have been solved, it is generally understood, and is no longer discussed.

It seems to be only a case of paying the price. Burning of wood pins stopped when they were replaced by metal pins. Burning of arms and pole tops stopped when the three pins were connected electrically, cracked or broken insulators immediately replaced by sound ones and the insulators kept clean. This cleaning may mean once a year or oftener, depending on the local conditions, and must be learned from local experience.

Of the three items, metal pins, electrical connection between pins, and clean insulators, neither can be dispensed with in foggy districts without running the risk of interruption to service. The inexpensive copper wire connections between the pins will reduce the amount of expensive cleaning required but will not eliminate it entirely. Three years' experience with connected pins on several hundred poles, in a location of severest fog conditions, seems to prove the above claims by the testimony of phenomenally immediate reduction in annual number of pole top fires after connecting the pins.

Cracked Insulators

The problem of cracked pin type insulators is yet heard from occasionally, and how the United Railroads has been treating this problem on 11-kv. circuits maintained for the Sierra and San Francisco Power Company seems not to be generally known.

In the early days of iron pins cemented into corner insulators, when the linemen gave the insulators on the 13-kv., a.c. lines their annual or semi-annual cleaning necessitated by our local fog conditions, they discovered about one per cent mechanically defective. These two part corner insulators, of a factory test voltage of safety of about 7, had been cemented on hot dipped galvanized solid iron pins with litharge and glycerine. Some showed the inner shell cracked vertically from the lower skirt upward, and some showed the tops of the outer shell cracked off entirely under the tie wire. These insulators were Locke 103 and 408A. No straight line insulators on lead top pins failed. (Iron pins with cast lead sleeves have been in use locally since 1892.)

Theories of Failure

The natural diagnosis was that the breakage of the inner shell was due to the difference in coefficient of expansion between porcelain and iron, iron expanding over three times as much per degree rise in temperature as porcelain. The breakage of the top of the outer shell seemed likely to be due rather to a similar expansion strain from the cement used by the manufacturer of the insulator between the two parts, as the iron pin did not reach high enough to effect this rupture—as was proved by the top of the inner shell always being found intact, and because of the well known fact that the linear coefficient of expansion of cement is nearly three times that of porcelain. The question of the constricting effect of the tie wire being responsible for choking off the top of the insulator was not considered on account of the usual looseness of the tie on corner insulators.

The manufacturer was informed of the failures and our theories. Neat Portland cement was substituted for litharge and glycerine for cementing the iron pins in place, but the cracking of the lower shell continued although the depth of the cement around the pin in the upturned lower shell was reduced to the exact length of the thread in the porcelain.

The percentage of cracked insulators has shown a progressive annual increase. In 1919 5.25 per cent of corners cleaned "cold" were found cracked, and of those cleaned "hot," where detection of cracks was less effective, 3 per cent.

A European Method

About three years ago a report reached the writer that a visiting Danish engineer, who had come to this country in search of a preventative for cracked insulators, had reported good results in Europe on pin type insulators from a coat of orange shellac applied around the pin where it is cemented into the porcelain. The idea was that the dried coat of shellac had sufficient elasticity to yield to the difference in expansion between that of the iron pin and the enclosing cement and porcelain, and thus relieve the strain on the porcelain and prevent shattering of the insulator.

The data according to one authority are as follows:

COEFFICIENTS OF EXPANSION FROM 32° to 212° F. BRITISH BOARD OF TRADE (CLARK)

Neat Portland Cement	.001070	2.97
Wrought Iron	.001166	3.24
Porcelain	.000360	1.00

The dimensions of the square cross-section of the part of the iron corner pin cemented into the insulator is .875 in. by .875 in. The maximum seasonal range of temperature in San Francisco was assumed as about 60° F.

LINEAR EXPANSIONS OF .875 INCHES FOR RANGE OF 60° F. FROM 32° TO 92°F.

Cement	.00031185 in.			
Wrought Iron	.00034020 "			
Porcelain	.00010500 "			
Excess expansion of	Iron	over	Cement	.00002835 in.
" " "	Iron	"	Porcelain	.00023520 "
" " "	Cement	"	Porcelain	.00020685 "

This means a difference of a fifth of a thousandth of an inch to be provided for in the elasticity of the shellac to take care of the excess expansion of the cement over that of the porcelain and a thirty-fifth of one thousandth of an inch to be provided for in the shellac cushion to take care of the excess expansion of the iron over that of the cement and neutralize the cumulative action of the iron and the cement expansion concentrating on the porcelain. As roughly bearing out the above figures on expansion, the condemned insulators had several large cracks in the porcelain lower shell outside of the cement and only a hair line crack in the cement outside of the iron pin.

Success in Application

When the United Railroads linemen that year began to turn in cracked corner insulators they were supplied with insulators cemented on iron pins that had been given two coats of shellac on both sides and top. These pins were given a distinctive mark but none of these shellaced pins have yet developed cracked insulators. The total thickness of these two coats of shellac was .00325 in., thus increasing the thickness of the square iron pin by .0065 in.

The next lot of cracked insulators were given an added film of cushioning material to absorb the expansion strain from the cement by having the whole inner surface of the pin hole in the insulator given a liberal coat of shellac beside the two coats on the iron pin, thus trying to take care of both the excess expansion of iron pin and assembling cement over that of porcelain, as well as sealing the surface of the porcelain so as to prevent absorption of the cement into the pores of the insulator and the later strains of crystallization from the cement crystals left in the porous unglazed porcelain after the cement had dried.

A Field for Experiment

It was assumed that the Danes had selected orange shellac after elaborate tests of other elastic films and no other solutions of asphaltums, gums or resins have been experimented with. There are a multitude of different kinds of elastic films that can be deposited on an iron pin from solutions of alcohol or benzine, and there may be a better designed varnish for this insulator purpose than shellac. Again, orange shellac may not prove as satisfactory in its cushioning results where the range of temperature is higher than the 60° F. that is assumed to prevail in San Francisco. Also, it may be contended that the insulators mounted on the later pins were of later design and would not have cracked even if no shellac had been applied to the iron pin. As bearing this point out in part is the fact that not only have none of the later insulators provided with shellaced pins developed cracks in the lower shell, but none have had the tops of the upper shell cracked off where the effect seemed clearly due to assembling cement used in manufacture and to be inaccessible to any remedial action from pin cushioning far below it. This is not the last word on the subject, as one of the manufacturers of suspension type insulators is said to have tried to obviate this cracking of porcelain shell from expansion of the cement luting and iron bolt by giving the top of the shell a capping of wax and mounting a disk of compressible material on the top of the bolt before they are assembled and cemented in place. (Austin: "High Tension Insulators," 1917 Proceedings A. I. E. E., page 554, third paragraph.)

No Failures

The fact that may be of interest is that there has not yet been a case of a cracked insulator mounted on a shellaced corner iron pin reported, although some of these insulators have been in service for three years, while similar ones only four years in service but without shellaced pins have failed both in upper and lower shells from simple radial differential expansion strains, apparently, as evidenced by the characteristic cracks just mentioned. As the depth of the cement in which the pin was set has not been reduced, the credit for the improvement is hoped to be due entirely to the use of the shellac. So far it is a hope only, as there are corner insulators still in service that were set up in 1902 and that have not yet cracked although their pins had no coating of shellac put on them—some with litharge and glycerine and some with Portland cement as assembly luting between iron pin and lower shell, and all with the lower shell more deeply filled with cement around the iron pin than the shellaced ones.

Extending the Principle

If shellacing the iron pin will cushion out the surplus stress resulting from the expansion and prevent the cracking of the lower porcelain shell, it would seem logically as if shellacing before assembly the inner surface of the outer shell and the outer surface of the inner shell, would tend to cushion out the surplus stress resulting from the cement expansion and prevent bursting of the outer shell.

The United Railroads has had such assembled corner units in service on test for a short time without failure, the assembly having been made at 60° F., about the half-way temperature between the local seasonal limits assumed, namely, 32° and 92° F., and in the insulators installed at identical locations from which similar but unshellaced units had been removed shattered by expansion strains.

The assembly cement employed was the ordinary Portland cement used in building operations and of unknown capacity for absorption of moisture.

The two annular surfaces of cement between shells and between lower shell and iron pin were covered with lime-resisting paint to secure permanent waterproofing and to minimize the absorption of water and the continuously progressive expansion of cement that is said to result from repeated cycles of alternate moisture and dryness.

If this elastic film of shellac varnish on the adjacent grip surfaces of the two shells as just suggested does not interfere with the adhesion of the cement and the rigidity of the assembled unit, it may render an additional and important service in sealing these unglazed surfaces from absorption of cement liquor whose subsequent evaporation is said to leave deposits of crystals in the pores of the porcelain that exert great mechanical stresses. Probably a cheap cement can be invented that will combine the permanence of the Portland cement and the elasticity of the shellac and can be used for assembling multipart pin type insulators so as to practically eliminate the rupturing stresses due to the different coefficients of expansion of iron, assembling cement and porcelain as well as the stresses from cement crystallization deposits in the porcelain.

If the correct theory of the cause of the deterioration of suspension type insulators is that it is due chiefly to expansion and not to porosity, as is claimed by Brundige ("Expansion Effects as a Cause of Deterioration in Suspension Type Insulators," 1917 Proceedings of A. I. E. E., page 535), this elastic varnish idea may help solve the problem of deterioration of the suspension type insulator.

Determining Temperature Range

How many coats of elastic varnish are going to be required to compensate for the differential expansion and how much this differential expansion amounts to are questions yet to be learned, as the temperature ranges are hard to determine.

That this is a fact is clear from the reports of linemen sent in fog storms to reported pole top fires on crossarms carrying pin type insulators. They have found the iron pins at night showing from the ground, red hot in the enlarged burning holes in the wood arm. When one reflects that the temperature of iron showing bright red in the dark is 752° F. it is seen that a seasonal range of local atmospheric temperatures is not a safe or even a reasonable basis for cushioning provisions against differential expansion in multipart porcelain high tension pin type insulators with cemented pins.

An additional good feature of this elastic film treatment is worth mentioning. The shellac seems to contract progressively. After several days had been allowed for drying and the varnish appeared hard, the assembly of the corner pin and insulator was completed. After a week for the cement to dry it was found that the pin was slightly loose in the cement setting, indicating a slight air space of about a hundredth of an inch to assist the elastic films in compensating for the differential expansion strains.

THE MOST EFFICIENT MANNER OF HANDLING SALESMEN AND SOLICITORS

BY WM. H. GRIBBLE

(Direct personal "backing-up" has long been recognized as a most effective stimulus to successful work. The proprietor of the Western Gas and Electric Appliance Company of Chico, California, is of opinion that the principle might be more widely applied in the relationships of the dealer with his salesmen and solicitors. This was one of the important papers presented at the recent Santa Cruz Contractor-Dealer convention.—The Editor.)

To get the most efficiency from salesmen and solicitors a dealer must first interest himself in them, and make up his mind that he must cooperate to the fullest extent.

Personal Assistance —

First of all, he must endeavor to keep the solicitor from becoming discouraged. This he can do by meeting him as often as possible, discussing his work, looking over his prospects, and endeavoring to lend some assistance in closing sales. He should give the solicitor suggestions, if possible, concerning some of the people he is well acquainted with, and if he finds that he is becoming discouraged or that he has not been very successful in closing many sales, he should endeavor to find some live prospects and give them to the solicitor.

Support by Advertising —

A dealer should back up the work of a salesman or solicitor with the proper kind of advertising, also with good window displays and store arrangements, featuring an article, or at least some articles that the solicitor is featuring. Or if no feature sale is being carried on, the dealer should advertise some prominent article which would give the salesman the broadest opportunity possible.

A great many dealers (as I gather from talking with salesmen, particularly specialty men who visit a large number of dealers and endeavor to assist them in the sale of washing machines) seem to feel that when they have employed a salesman or solicitor it is not necessary for them to do anything except allow him to work on his own initiative, without any assistance in the way of personal interest, advertising, or anything else. All they expect is a substantial number of sales, and if the solicitor does not make them, they consider him a failure and an expensive experiment.

Circular Letters and Interviews —

A dealer should also back up a salesman or solicitor by circular letter work, and personal work, sent out by the dealer as the prospects come in; and if he finds that there is any way in which he may be able to lend assistance by a personal interview, he should also do this in order to gain the confidence of the salesman and assure him that everything is being done to help him make a success.

Finally, the dealer should assist the solicitor by following up the prospects by phone calls, which have the same effect as letter work in both encouraging the solicitor and at the same time getting the dealer or the firm in direct contact with the prospect—a proceeding which very often creates more confidence on the part of the prospect.

The Business Library

BY LOUISE B. KRAUSE

(People, places, organizations; financial and population statistics; who's who in your industry —questions about these come up hourly in most modern businesses, and the business library which has the right kind of reference books has the desired information in the most accessible form. The librarian of H. M. Byllesby & Company of Chicago here lists some of the best directories, atlases, and year books for the business library. Written permission is necessary to reprint from this series of articles.—The Editor.)

REFERENCE BOOKS FOR THE BUSINESS LIBRARY

(Continued from August 15th issue)

The United States Bureau of Foreign and Domestic Commerce publishes each year the **Statistical Abstract of the United States** at 50 cents per volume, paper binding, or it may be had in cloth. This abstract gives tabulated statistics covering a number of years on the natural resources and various economic activities of the United States. This Bureau also publishes annually a valuable volume of statistics entitled **Foreign Commerce and Navigation of the United States,** which gives statistics of imports and exports of different classes of merchandise with rates of duty, quantities, and value.

For commercial, political and statistical information about foreign countries the **"Statesman's Year Book,"** a British publication issued annually by Macmillan, at $3.50 per volume, is a valuable addition to any business library. It also gives a list of the best books on each country and its most important government publications, and includes a list of books relating to the war and a diary of its principal events. Maps of the different countries are also included.

The American Newspaper Annual, a directory published by Ayer and Son, Philadelphia, price $5.00, gives a list of all newspapers and periodicals published in the United States and territories, Canada, Cuba, West Indies, arranged by states and cities, with maps of the states and information about the industries and institutions of each city. It gives the population of cities and towns of the United States and Canada whose population is over 3,000. It lists all publications in foreign languages printed in different states of the United States, and also gives a list of trade papers for certain industries.

Rand McNally's Commercial Atlas of America, published annually, price $20,00, is the best atlas of its kind on the market for a business office. The maps are indexed, and information on population, express offices, United States money order stations and the railroads of each town and city are given. This atlas has maps of the largest cities. Steamship and interurban lines are also shown.

Another valuable guide is the **Official Hotel Red Book and Directory** of the United States, Canada, Mexico, Cuba, Hawaii, West Indies and South American cities, published annually by the Official Hotel Red Book and Directory Company, New York City, price $3.00. This guide lists hotels under cities with brief notes on accommodations and rates.

The **Official Guide of the Railways and Steam Navigation Lines** of the United States, Porto Rico, Canada, Mexico, Cuba, also time tables of railroads in Central America, is published monthly by the National Railway Publication Company, New York City, $10.00 per year. It gives the current time tables in effect and the maps of the various railroads with indexes of their stations, and a general alphabetical index of all railway stations in the United States, Canada, Mexico, showing on what railroads a given place is located, with a similar index for points reached by water routes.

United States Official Post Office Guide, issued annually with eleven monthly supplements at $1.00 per year, gives information about mail rates and post office rulings, and also gives a complete list of the post offices in the United States.

The business library will find it helpful to obtain a single volume published by the Census Bureau entitled **Abstract of the Thirteenth Census of the United States, 1910,** which may be procured from the Superintendent of Documents, Washington, D. C., at the cost of $1.00. This abstract gives in condensed form with explanatory text, statistics to be found in the eleven volumes report of the 1910 census covering population, agriculture, manufactures and mining of the United States as a whole, individual states and principal cities. This abstract volume is issued in special editions for each state of the United States, which give special statistics pertaining to that state.

In regard to population figures, it is probably not generally known that the Census Bureau has issued bulletins giving estimates of the population of cities for each year subsequent to 1910, so that population figures for 1910 need not be considered as the latest official figures available.

The reference collection of a business library must be strong in books which will serve as directories of persons and industries, in order to answer questions on "who is who" and "where and what" are certain business organizations. The important point for consideration in selecting directories for a business library is that they must be not only accurate but as nearly up-to-date as possible, to be of real value.

Who's Who in America, a biographical dictionary of notable living men and women of the United States, giving brief biographical data and addresses of over twenty thousand Americans prominent in business and public affairs, professional life, or as authors, published biennially by A. N. Marquis and Company, Chicago, $5.00 per volume.

There are also similar brief biographical dictionaries published for certain states and cities which will be well known to the public libraries in those particular localities, and which will not be listed here as they are not of general interest to all localities;

for example, **The Book of Chicagoans, Who's Who in New England, Directory of Directors in the City of New York.**

Every business library will need the latest edition of the **Congressional Directory,** as all business firms have at some time correspondence with, or need of information on, congressmen, committees, departments and bureaus of the Government, also diplomatic and consular service. This volume may be purchased from the Superintendent of Documents, Washington, D. C., for 60 cents, in cloth binding.

The membership lists of national organizations representing different professions and industries are also very valuable, such as the membership of the American Society of Mechanical Engineers, American Society of Civil Engineers, and other associations devoted to business interests as well as to professional work. The city directory and telephone list of any community must not be forgotten as helpful reference aids, also state gazetteers, and the collection of directories of various cities to be found at the public library will be found most useful.

G. P. Putnam Sons, New York City, publish a handbook called **Directory of Mailing Lists, Obtainable in Book or Pamphlet Form,** price $2.50, which tells where printed mailing lists of certain industries or classes of people may be obtained free or at a reasonable price.

Public Affairs Information Service, a weekly or bi-monthly cumulated service, according to the needs of subscribers, and cumulating in an annual volume, published by the H. W. Wilson Company, New York City, is a subject index to articles in current periodicals, pamphlets and books covering current economic problems. Price upon application. It is a valuable index to consult at the public library, as it is too expensive for the small business library.

Thomas' Register of American Manufacturers—"first hands in all lines"—is an indispensable directory. It is published annually by the Thomas Publishing Company, New York City, price $15.00. The entries are in three main sections. The first section classifies the manufacturers according to their products, in an alphabetical subject list; the second section lists the manufacturers alphabetically by their names, gives addresses, branch offices and officials for many of them; the third section lists all the popular trade names alphabetically, and there is an alphabetical index of subjects at the beginning of the volume, with plentiful cross references to all the subjects listed in section one.

The Reuben H. Donnelley Corporation, Chicago, publish semi-annually a "Red Book" of classified advertisers, which appear in the classified telephone directories issued by them for various cities, and which is furnished free to any firm who will use it sufficiently to justify placing a copy with them. It purposes to be absolutely up to date, and its second section is arranged by states, thus enabling the user to locate firms in his immediate neighborhood.

Exporters and importers will find most useful, Kelly's Directory of Merchants, Manufacturers and Shippers of the World, 1919, Kelly Publishing Company, 70 Fifth Avenue, New York City, price $15.00.

The organization, personnel of management, earnings and financial history of industrial corporations in the United States is given in **Moody's Manual of Industrials,** which is one of a trilogy costing $40.00 per annum, published annually by Poor's Publishing Company, New York City. The other two volumes are entitled **Moody's Manual of Public Utilities** and **Poor's Manual of Railroads.**

Moody's Analyses of Public Utilities and Industrials, and **Moody's Analyses of Railroad Investments** cover much the same ground as the manuals just noted with the addition of ratings. They are published by John Moody, 35 Nassau street, New York City.

The Manual of Statistics Stock Exchange Handbook, similar in contents to the Poor & Moody volumes but not as full, is published annually by The Manual Statistics Company, New York City, at $5.00 per volume.

Investment Bankers and Brokers of America, issued annually by H. W. Sites, 80 Lafayette street, New York City, $10.00 per volume, is a useful directory to be used to supplement **Rand McNally Bankers' Directory,** issued semi- annually in January and July, Chicago, price $6.00 per volume, or the **Bankers' Encyclopedia,** issued semi-annually in March and September, New York, price $8.00 per volume.

For the business firm who wishes to keep up to the minute on the latest information of what is going on in the world as affecting trade and finance, the Standard Statistics Company, 47 West street, New York City, issues **Standard Daily Trade Service** at a cost of $120.00 per year, which delivers each morning by first class mail a conveniently indexed and itemized digest of the important news regarding crops, commodities, countries, legislation, taxation, Federal trade regulation, transportation, etc., and in addition gives the subscriber the benefit of a Personal Service department for special information of value to him individually which does not appear on the daily report sheet.

In addition to the Daily Trade Service, the Standard Statistics Company also issues a similar daily service entitled **Corporation News Service,** which summarizes all the corporation news of the country. It also issues a **Corporation Card and Bond Card Service** which furnish daily revised card descriptions of corporations and bond issues.

The **Federal Trade Information Service,** 31 Nassau street, New York City, is similar in frequency and form of issue to the standard Daily Trade Service but is not as comprehensive in scope, as it covers only the activities of the Federal Government.

There is scarcely any industry which has not put out a reference handbook or directory covering its special field, and it is impossible in a brief article to list all of the reference books which pertain to a large number of industries. The best printed list from which to determine what directories and handbooks have been issued for certain industries is **"1600 Business Books,"** which has been previously noted. Consult also the trade journals, and above all, do not forget to use the reference facilities to be found at the public library.

FUEL OIL AND STEAM ENGINEERING

(The economics in fuel oil secured through automatic control in steam plants have made possible such records as those achieved in the Arizona plants reported in the August 1st issue of the Journal of Electricity. Preliminary to such accomplishments must come such studies as the one here presented as to the relationship of oil and steam pressures which results in the greatest boiler efficiency. The author of this important contribution to fuel oil practice is chief engineer of Chas. C. Moore & Company, engineers of San Francisco.—The Editor.)

INFLUENCE OF LOAD ON PRESSURES OF OIL AND ATOMIZING STEAM IN OIL BURNERS

BY C. R. WEYMOUTH

Very little information has been published concerning the oil pressure to operate oil burners at different rate of firing, or the steam pressure necessary to give proper atomization with a minimum quantity of steam. In the average plant, hand controlled, the oil pressure is maintained at a constant pressure by means of a pump governor, and the supply of oil to the burners is controlled at each burner by the burner oil-throttle valve, and similarly the supply of steam to burners by the burner steam-throttle valves. In times past engineers have debated the advisability of carrying higher or lower oil pressures at the pumps, as influencing the economy of firing the boiler, without stopping to think that any surplus in pressure over and above that necessary to force the oil through the burner orifice, must be overcome by the friction of the oil-throttle valve, and that unless the load on the burner or the rate of oil firing changes, any increase in pressure at the pump above the necessary minimum, has no effect whatsoever on the performance of the burners, or the pressure between the burner-throttle valve and the tip of the burner.

Also, it is not generally known that a comparatively low steam pressure furnishes all of the steam necessary for atomizing oil at the lighter loads, and that the maximum steam pressure at the burner, generally speaking, can be considerably less than the boiler pressure. From this fact it is apparent that unless the steam-burner throttle valves are closely regulated a large waste in steam is permissible, corresponding to the difference between the steam pressure necessary to atomize the oil at a given load, and the maximum or boiler steam pressure.

Tests with Oil Burners

With the present-day high price of fuel, and the special effort that is now being given towards the conservation of fuel and other resources, it is thought that a brief review of certain test data will be of interest to fuel oil users. The test data given is taken from a report to Chas. C. Moore & Company, Engineers, dated July 1, 1907, by G. Chester Noble, then assistant professor of electrical engineering, University of California. The data from these tests was the basis of the initial design of the Moore Automatic Fuel Oil Regulating System, by Chas. C. Moore & Company, Engineers. It happens that all of the burners tested were of the external atomizing type, the particular burners selected being those which were available for the work, without any preference as to make of burner. The oil burned at that date was practically crude oil, which was somewhat heavier in gravity and considerably more viscous than the topped oil now generally used in this vicinity for fuel purposes.

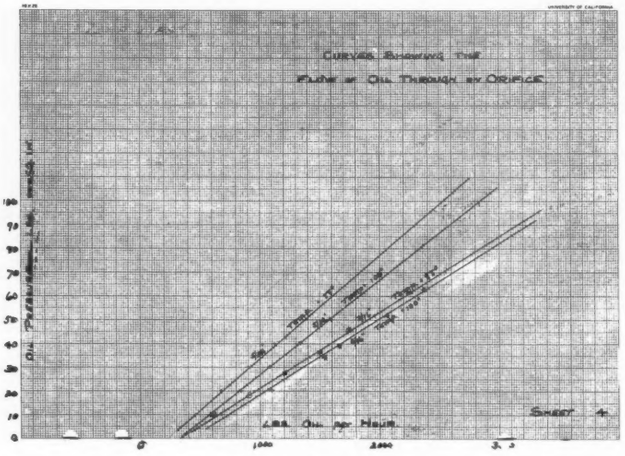
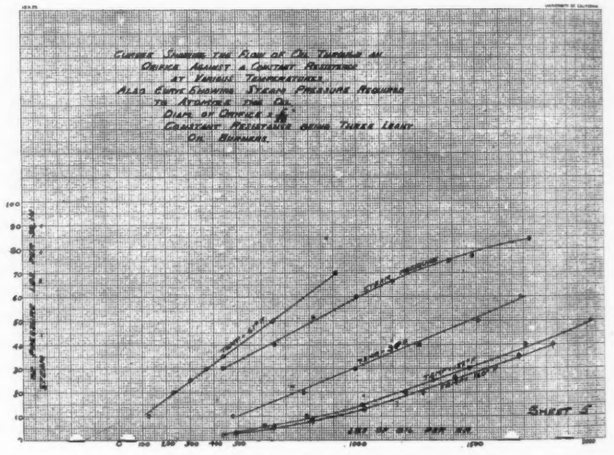


Chart showing the flow of oil through orifices of a stated diameter at different temperatures. It is to be noted that for a given temperature and orifice, the rate of flow is almost directly proportionate to the pressure.



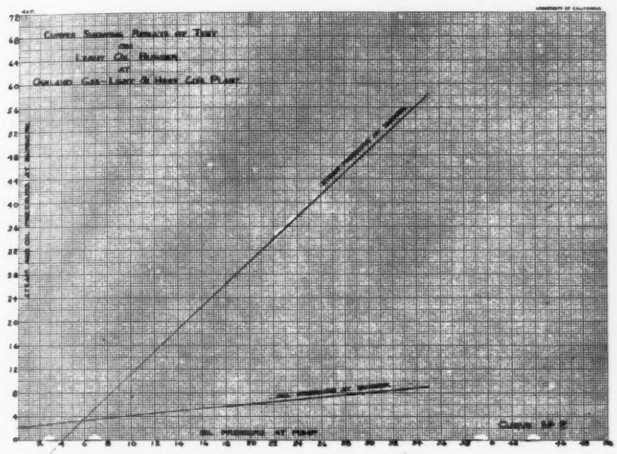
Curves showing the flow of oil through an orifice and length of piping at various temperatures. To this is added a curve showing the steam pressure required to atomize the oil. Diameter of Orifice = 5/32 in. A constant resistance was maintained against three oil burners connected in parallel.

Sheet No. 4 herewith gives data as to the flow of oil through orifices of stated diameter at different temperatures. The specific gravity and viscosity of the oil were not observed at the time. It will be seen that the plotted points fall practically on a straight line, indicating a flow of oil for a given temperature and a given orifice nearly proportionate to the pressure; and it is interesting to note that with the oil then used, a pressure gauge in the burner line so placed as to record the pressure on the oil burner orifice, was a rough index as to the rate of flow of oil, or the relative load on the boiler.

Sheet No. 5 gives additional data, being the flow of oil through an orifice and length of piping, including also the resistance of three oil burners connected in parallel. The curve also shows the steam pressure necessary for atomizing the oil used by the burners. It will be observed that the curves of oil pressure and of steam pressure are nearly straight lines. The tests for both of the above curves were made at the University of California.

Curve No. 3 gives tests showing oil pressure and steam pressure at burner at the old Third Street Plant of the Pacific Light & Power Company, Los Angeles.

Curve No. 2 gives similar data at the plant of the Oakland Gas Light & Heat Company, Oakland, now Station "C," Pacific Gas & Electric Company.



Test data showing oil and steam pressure at burner at the Oakland Gas, Light & Heat Company's plant, now Station "C" of the Pacific Gas & Electric Company.

Sheet No. 10 gives results of various tests, in which the steam-pressure and the oil-pressure on the burner are the two variables. It is apparent that the curves represent practically straight lines.

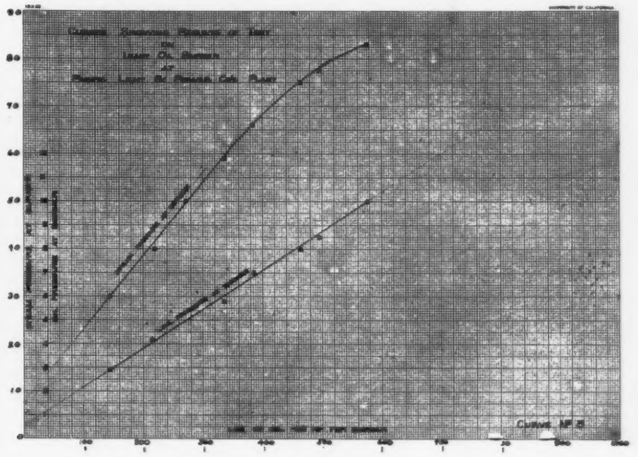
Sheet No. 6 shows the influence of temperature on the flow of oil through an orifice, the pressure difference remaining constant.

Practical Application of Test Data

To illustrate the application of the above data in the design of the Moore Automatic Fuel Oil Regulating System, now in use in a number of prominent plants in the West, it should be stated, for those not familiar with the details of this system, that it operates on the principle of central control instead of individual control of the burners and dampers. The oil burners and valves are left wide open, or nearly so, and a variable oil pressure is maintained in the oil-burner header to give an equal pressure at all burners, the pressure varying with the load, controlled automatically by throttling the supply of oil to the header, to maintain a nearly constant steam-boiler pressure. As in most plants, burners must be designed to handle very heavy oil and also to permit heavy overloads on boilers, the average pressure at the burner at normal loads is very low and but a few pounds. To build up the pressure in the oil-to-burner header, and to prevent the friction in the header causing an unequal supply of oil to all burners, a resistance, due to a diamond-ported regulating cock, is inserted in each burner-branch pipe between the main throttle valve and the tip of the burner and set to give such resistance that the pressure in the header at normal load on the boilers will be 20 or 30 lb. or thereabouts, depending upon operating characteristics, etc. Then a slight pressure drop in the header would have little effect on the unequal supply of oil to the various burners.

The oil pressure gauges connected to this header are located in the front of each battery of boilers, so that the firemen can tell approximately, from the reading of the oil-pressure gauge, the relative rate of firing of boilers.

A low pressure steam header is similarly connected to all burners, but generally without the diamond ported valve as a resistance, the pressure being



Curves shownig relationships of steam and oil pressure at burner during a test on a Leahy Oil Burner at the old Third St. Plant of the Pacific Light & Power Company, Los Angeles.

high enough without this resistance. The supply of steam from the main boilers to the low pressure burner-header, and its pressure, are controlled by means of a special throttle valve, generally known as a chronometer valve, and this chronometer valve is in turn controlled by a steam-to-burner regulator actuated by the variable oil pressure in the oil-to-burner main.

Relation of Steam Pressure to Oil Pressure

If the curve of steam and oil pressure, as mentioned above, is a straight line, then the steam pressure is equal to the oil pressure multiplied by a coefficient plus a constant. At one plant this relationship was found to be such that the steam pressure at the burner was equal to the oil pressure times three, plus thirty; thus at rating the oil pressure was 20 lb. and the steam pressure was 90 lb.; at 50 per cent overload the oil pressure was 30 lb. and the steam pressure was 125 lb.; at half the load the oil pressure was 10 lb. and the steam pressure was 60 lb.

Figure No. 1 shows the steam-to-burner regulator designed to meet the above relationship. There are two diaphragms, one actuated by the pressure in the oil-to-burner main, and the other by the pressure in the steam-to-burner main. The fulcrum is adjustable to give the desired ratio factor; the yardarm contains an adjustable weight which takes care of the constant pressure difference such as the figure 30 lb. mentioned in one plant above. The movement of the yardarm controls a pilot valve in the small hydraulic cylinder, which in turn controls the chronometer valve supplying steam to the steam-to-burner main.

Fuel Oil Regulating System

While it is not the purpose of this article to describe in detail the Moore Automatic Fuel Oil Regulating System, it should be stated that the air supply is likewise controlled by a damper regulator in which

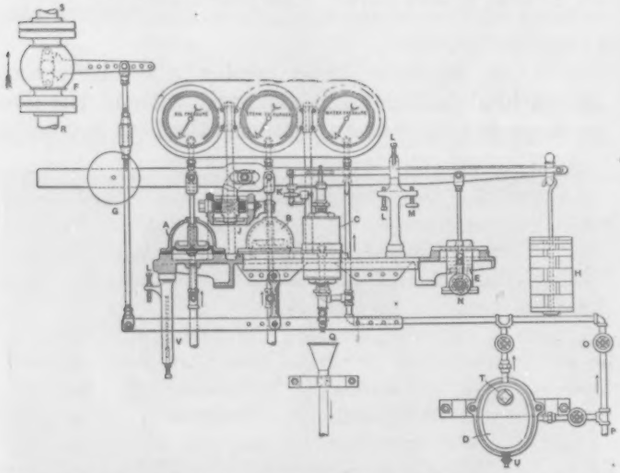
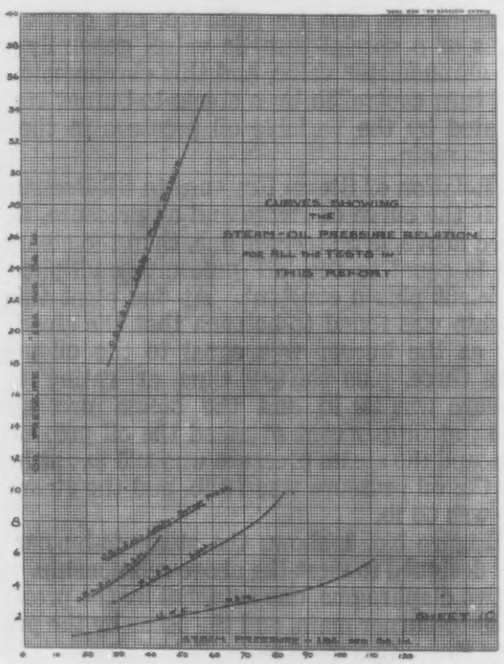


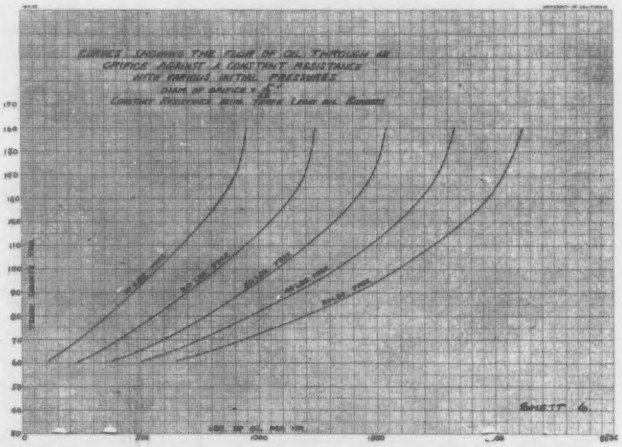
Fig. 1—The steam to burner regulator designed to meet the relationship determined between oil and steam pressure. There are two diaphragms, one actuated by the oil pressure, the other by the steam. The fulcrum is adjustable to give the desired ratio factor and the yardarm contains an adjustable weight which takes care of the constant pressure difference. The movement of the yardarm controls a pilot valve in the small hydraulic cylinder, which in turn controls the choronometer valve supplying steam to the steam-to-burner main.

all boiler dampers are connected to a common rockshaft which in turn is moved by a hydraulic cylinder. The position of the rockshaft is determined by the oil pressure, the dampers being opened as the oil



Curves showing the steam-oil pressure relation for all tests here reported. Note that these curves represent practically straight lines.

pressure increases, coincident with an increase in load. On actual test of a hand-fired boiler it was found that the movement of the boiler damper was nearly proportional to the oil pressure, and that the deviation from this rule could be corrected by the angularity of the damper rods, etc. The elements of the damper controller are, therefore, a diaphragm actuated by the oil pressure, a yardarm moved by the diaphragm, and a coil spring resisting this movement. It is thus evident that the movement of the



The influence of temperature on the flow of oil through an orifice against a constant resistance with various initial pressures.

yardarm is then proportional to the change in oil pressure; this movement is then communicated by means of a hydraulic cylinder to the main rockshaft, a differential control valve actuated by the yardarm regulating the pressure of water to the hydraulic cylinder.

In actual service the system is giving record performances for boiler efficiency over long periods.

For those interested in this system, a detailed description will be found in the Transactions of The American Society of Mechanical Engineers, Volume No. 30, an article entitled "Unnecessary Losses in Firing Fuel Oil and an Automatic System for Their Elimination."

Application on the Pacific Coast

It should be stated that the grade of oil now being used on the Pacific Coast, by reason of its lighter gravity, lower viscosity and higher average temperature of firing, exhibits flow characteristics differing from those shown by the above curves. It is possible, however, to adjust the Moore Automatic Fuel Oil Regulating System to accommodate these changes in characteristics of oil, and that just as favorable results for boiler efficiency are being secured with the present-day oil as when burning the crude oil of the grade used in connection with the above tests.

THE PRINTING TELEGRAPH

The printing telegraph came into extensive use in the United States during the period of the war when the demands upon the telegrapher were so heavy. The printing telegraph consists of a sending instrument equipped with a keyboard similar to that of a typewriter, and electrically connected with a receiving instrument in such a manner that the latter automatically reproduces what is typewritten on the sending instrument.

PRACTICAL LESSONS IN ELECTRICITY

BY H. H. BLISS

(Why different types of motors are used for different kinds of work, and the requirements and principle of operation of the various types are explained in this article, the eleventh of the series on practical electricity published in cooperation with the Extension Divisions of the Universities of California and Oregon. Additional material for the course is supplied by the universities.—The Editor.)

Direct Current Motors.—For operation upon d.c. circuits motors are built of three different types. They are known as series, shunt and compound motors, the names referring to the connection between the armature and the field winding, as in the case of d.c. generators. The magnet coils in a series motor consist of a few turns of large wire carrying

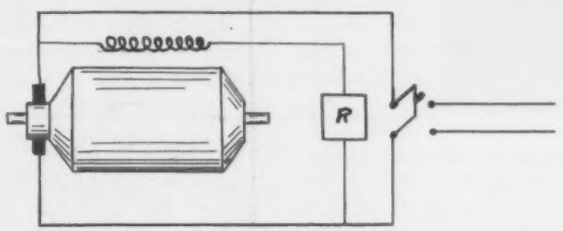
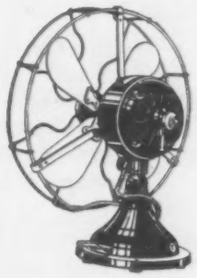


Fig. 1—Cutting down the field current in this shunt motor by means of the rheostat causes the armature to run faster. It must do this to keep the counter electromotive force nearly equal to the voltage of the line.

the whole current of the machine. A shunt motor has field windings of small wire and many turns, connected in multiple or shunt with the armature. Both series and shunt coils are put upon the field of a compound motor.

The **"torque"** or turning effort of a motor depends upon the strength of the magnetic field and hence is proportional to the field current except for the disturbing effects of saturation and armature reaction. Therefore, decreasing the field current to half value cuts the torque approximately in two. This is on the assumption that the current in the armature remains constant, for the torque is directly proportional also to armature amperes. Then in a series motor, where the same current flows through armature and field, triple current would give nine times the torque were it not for the disturbing factors mentioned above. (On test a certain 500-volt machine was found to give with 60 amperes five times as great a torque as with 20.)

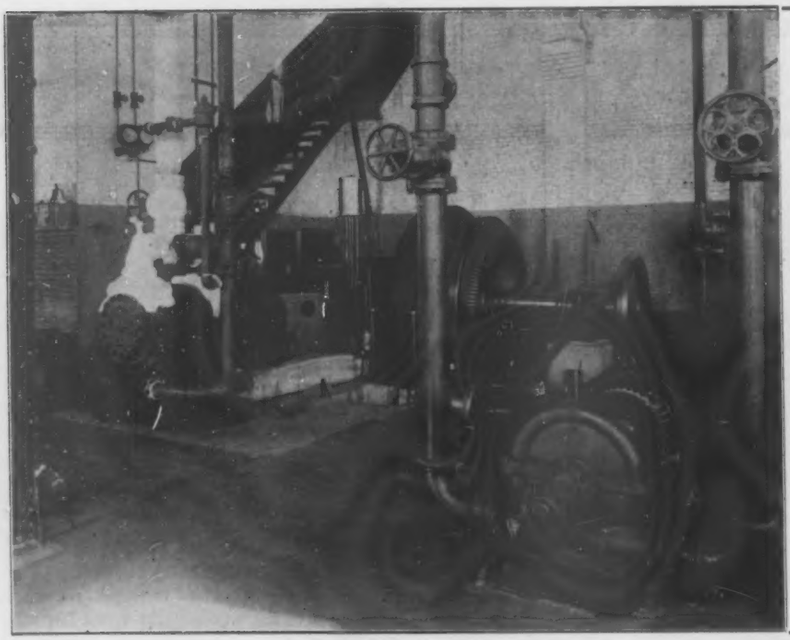
Series motors are used for electric railways, hoists, cranes, etc. When a street car starts up-hill from the level the motors at once lose speed and the counter e.m.f. decreases. More current is thus permitted to flow and this raises the torque of the motors sufficiently to carry the increased load. This flexibility in regard to torque and speed is what



This direct current G-E fan runs at 1500 r.p.m. When the fan blades are removed, the motor runs at about 3500 r.p.m. Is the field shunt, series, or compound wound?

makes the series d.c. motor the most convenient for all such applications as hoisting and traction where heavy and variable loads must be frequently started and stopped. It is necessary to keep a series motor coupled to its load, however, and to control it carefully, for if the load is removed the speed will run

The induction motor driving a wood saw. This small machine runs at 1200 r.p.m. when unloaded, and is rated at 5 hp. Can you guess the number of poles and frequency of the alternating current supply?



Refrigeration plant run by electric drive. In Southern California this large motor runs at 200 r.p.m. on 50-cycle current and drives an ammonia compressor. How many poles on the revolving field of the motor?

very high, possibly ruining the armature by centrifugal action.

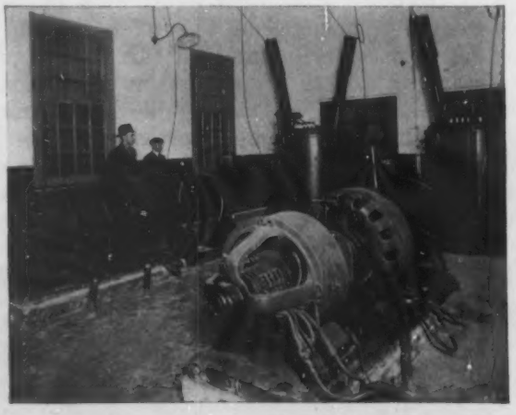
Shunt Motors.—When a shunt motor is operated without a load it does not run faster than a certain speed, behaving like a steam engine with a governor, in contrast to the series motor which acts like an ungoverned automobile engine. At the "no load speed" of a shunt motor it develops a back e.m.f. almost equal to the applied voltage, so that only a small current can flow. A slight increase in the speed would raise the back e.m.f. so high that no current could enter the armature and the machine could take no power from the line.

When a shunt motor is required to drive a load it must absorb more watts than when running idle. Suppose 100 volts applied to the armature and the back e.m.f. at no load equals 99. The net voltage driving current through the armature is, then, 1 volt, and the current will be 10 amperes if the resistance is 0.1 ohm. If a load is then applied which requires an input of 4 kw., the current must rise to $4000 \div 100$, or 40 amperes, which means that the net voltage must be $40 \times 0.1 = 4$. The back e.m.f. must drop to 96 volts, which means that the speed must drop to 96/99 of the no load speed. At full load a shunt motor runs about 5% slower than at no load.

It is often desirable to run a shunt motor at other than normal speed. In a machine shop, for instance, a motor driven lathe should have several available speeds suitable for different jobs. There are four ways of accomplishing this: (1) By installing a multivoltage system; (2) by rheostat control of armature current; (3) by changing the field flux mechanically; (4) by rheostat control of the field current.

With two or more generators one can apply to the motor armature different voltages and obtain speeds in proportion. The field strength may be kept constant by using always the same voltage for excitation. A similar effect may be obtained by putting a rheostat in series with the armature and thus lowering the applied e.m.f. by means of the voltage drop. This method is wasteful of power, while the first is expensive and complicated.

Weakening the field of a shunt motor by moving the poles and armature farther apart or by putting resistance into the exciting circuit changes the speed (see Fig. 1). Suppose the unloaded 100-volt motor considered above had its field weakened 7% — what alteration in speed would occur? The back e.m.f. would instantly fall to about 92 volts and a large



A Westinghouse motor-generator set run by direct current and producing alternating current. This last is raised to high voltage by means of transformers and then "rectified" for use in precipitating dust in flue gases.

current would flow ($8 \div 0.1 = 80$ amperes). This would produce a strong torque and speed up the armature until the back e.m.f. reached approximately its former value. Weakening the field increases the speed.

Compound Wound Motors.—Some motors have a series winding in addition to the shunt coils on the field poles. Imagine current supplied to a compound generator, entering at the positive (+) terminal (from which the current was sent out when the

machine was generating). Would the series field help or oppose the shunt field, and which way would the armature rotate? The current would flow in the old direction through the shunt coil (from the + to the — brush), but in the reverse direction through the series coil. Hence the field will be weakened by the series coil. The armature will rotate in the old direction, for it must produce an induced e.m.f. opposing current, and hence directed out at the + brush. When a load is put upon this motor the increased current in the series coil tends to weaken the field and hence to increase the speed. Thus a compound motor can be arranged to have a constant speed with varying load.

A "cumulative compound winding" is produced when the series coil is connected the opposite way, so as to assist the shunt coil. Such a winding gives a strong torque at starting, due to the heavy series current and the strong field it produces. An increase of load in such a machine causes the speed to drop more than with a simple shunt winding, as the increase of current strengthens the field. Such a characteristic is desired for such machines as punch presses, shears, etc. These motors with various degrees of compounding are used also for elevators, rolling mill machinery, etc.

Alternating Current Motors. — A synchronous motor runs at a constant speed which is determined by the number of poles and the frequency with which the supply current reverses its direction. Adding or taking off the load changes the number of amperes, and varying the field strength changes the "phase relation" of the supply current, but the motor runs at constant speed unless the load is heavy enough to make it "fall out of step" and come to a standstill.

Induction motors without load run at nearly synchronous speed. This can be calculated from the number of poles and the frequency of the supply circuit. For "60 cycle current" the revolutions per second = 60 ÷ no. of pairs of poles. Thus a 6 pole motor makes 20 revolutions per second or 1200 r.p.m. unloaded. The 50 cycle current used in Southern California drives a 4 pole synchronous motor at 1500 r.p.m.

As the load on an induction motor is increased its speed decreases, the "slip" varying from practically zero to 5% or more. Some motors, specially built with high resistance rotors, have a slip of 10 or 15%. Such machines are used for driving the rolls in steel mills and similar work where the load is heavy and intermittent. With a punch press, for instance, such a motor can speed up and deliver energy to a heavy flywheel during the interval between operations, and then slow down to give the flywheel a chance to do much of the work of driving the punch. A constant speed motor would be of very little value for such applications for it would be very heavily overloaded part of the time and idle for the remainder. The cumulative compound d.c. motor and the induction motor with large slip are much used with flywheels for this class of work.

The Electric Furnace in Practice

BY CARL H. BOOTH

(That an electric arc type furnace can be successfully operated in the melting of metals without the use of special electrical appliances and equipment is indicated by the satisfactory results obtained from the small furnace described below. This can be operated on the ordinary 110-volt single phase service obtained from most public service companies. The author is president of the Booth-Hall Company of Chicago, Ill.—The Editor.)

An electric furnace of the arc type which will enable a ton of metal to be charged, melted and poured in 7½ to 8 hours, has been successfully designed and operated by the Booth Hall Company of Chicago, Ill.

Mechanical Details —

The furnace rotates on rollers, and is carried by two cylindrical tracks. The rollers are driven by a motor, so as to rotate the shell at a speed of two revolutions per minute. No gearing is required encircling the furnace. The current is carried to the electrodes by means of short pieces of flexible cable, which connect to the above-mentioned track by means of shoes which press against them and form a sliding contact. The electrodes are regulated by means of screws, and on small furnaces are entirely hand-operated; but on the larger furnaces automatic control is used, thus doing away with the necessity of close watching on the part of the operator.

In the small furnaces the door is in one end only, but in the larger furnaces both ends are provided with a door.

Lining —

Probably the most important of all factors in reliable and efficient furnace operation is the lining. Especially is this true with the melting of non-ferrous metals, where a lining with many joints will have a decided tendency to absorb metal. In order to overcome this difficulty the lining provided with the Booth furnace is made with as few joints as possible.

The special brick lining is backed up with a layer of heat insulating material, so that when the furnace is at working temperature, the temperature on the outside of the shell is so that the hand can be placed upon it.

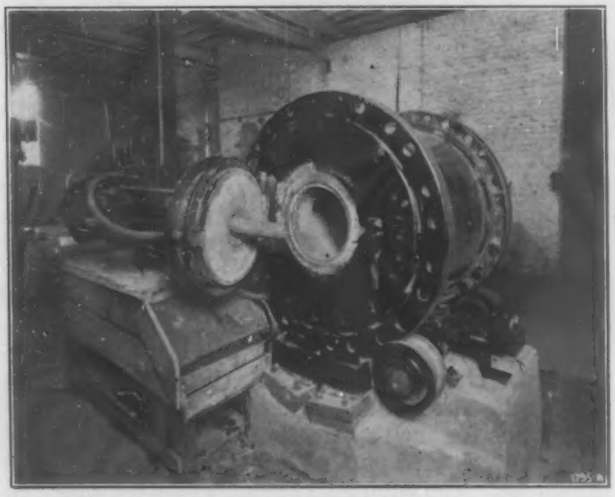
Operation —

In starting the furnace the tap hole is plugged with molding sand, the charge placed in the furnace, the door closed and the power thrown on. The electrodes are then brought together and the amount of current flowing regulated by moving the electrodes closer together or further apart, as indicated by the meter on the switchboard.

As the furnace is sealed up quite tightly from

the time the power is on until ready to pour, very good results as to metal temperature have been obtained by keeping the power practically constant for a definite length of time. After the operator has poured a few heats, it is possible for him to determine the right temperature practically every time without opening the door and inspecting the metal.

In pouring the furnace, the pipe stands which carry the water connection simply lift out of the way without it being necessary to unbolt anything, and



Rear view of 250-lb. Booth Electric Brass Furnace in the foundry of Leitelt Brothers, Chicago, showing charging door open ready for charging. Note the lining of the furnace, and the door made of one solid piece of brick.

the men can go right up to the furnace with the ladle.

When the furnace is ready to tap the operator stops the rotation until the tap hole is above the level of the holder, and thus above the surface of the metal. The tap hole is then opened by means of a sharp pointed steel rod. As the tap hole is simply plugged with molding sand there is no sledging or pounding required. After the tap hole is opened, the furnace is rotated down until the opening is below the surface of the metal, and the metal poured out into the ladle. If it is desired to only remove a portion of the metal, the furnace is again rotated back and the tap hole brought above the level of the metal in the furnace.

In melting ingots and heavier brass scrap, a heat will average from 30 minutes to an hour in length of time, depending upon the kind of metal poured and the size of the charges. A 300-lb. charge of copper ingots requires about an hour to melt and pour, while a 300-lb. charge of yellow brass requires about 40 minutes. The shrinkage with yellow brass ingots averages about 1 per cent and on red brass and high copper bronze, under 1 per cent. With the furnace hot the power consumption will run from 250 to 350 kw-hr. per ton.

Electrode Consumption —

With furnaces of this type the graphite electrode is to be preferred, due to its greater conductivity, which permits the use of the smallest size of electrode practicable for the current to be carried. On this furnace electrodes of 2½ inches diameter are used, machined and equipped with what is known as nipple joint. These are 30 inches in length. The electrodes enter the furnace through graphite sleeves. This opening is also protected by a water-cooling copper casting which serves to protect the electrodes from burning at this point.

Even with the small 250-lb. furnace shown, the electrode consumption is low. If the furnace is kept in operation fairly continuously during an 8-hour day, the consumption will average about 3 lbs. per ton.

On small furnaces of the size described, one furnace operator can conveniently handle three furnaces without the use of automatic electrode control.

Advantages —

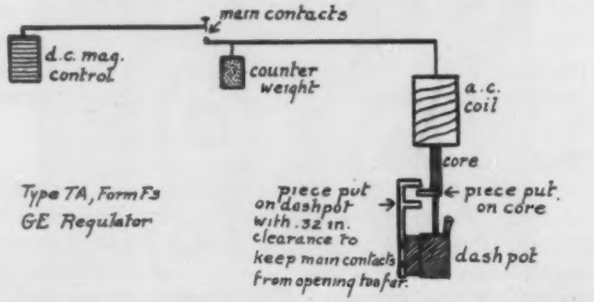
Simplicity in design, economy in handling and pouring and ease in making lining repairs are particular features of the furnace. The absence of overhanging cables and the simplicity of the electrical connections make expert operation unnecessary, while the complete rotation of the furnace results in more even wear on the lining, a greater absorption of heat by the metal, and improved power consumption. These factors help to bring down the cost of melting and upkeep charges.

LEADING POWER FACTOR CAUSES TROUBLE

BY M. F. ROBERTS

(Certain difficulties experienced by a central station in connection with a leading power factor were overcome by a device described below, designed to prevent the loss of exciting current consequent on variations in power factor. The plan, which will doubtless be of interest to others, is described here by the Power Plant Engineer of the Union Pacific Coal Company at Rock Springs, Wyoming, where it has been successfully tried out.—The Editor.)

We carry an average of 85 to 90% lag power factor, during our day peaks, until 4 p. m. About 9 p. m. the night peak comes on with the power factor rising up to 90% power factor lead; at different times the synchronous motors on the circuit



An ingenious device applied to the a.c. magnet core which prevents difficulty in the dropping of the load due to a lag on the part of the regulator

furnishing exciting current, instead of the station exciters. As the power factor drops back to unity, our regulator, not being quick enough to close its main contacts, causes us to lose our exciting current and to drop our load. This causes considerable inconvenience to all concerned as we supply four other towns with power besides Rock Springs. To remedy the trouble our electrical engineer, D. C. McKeehan, has put a stop on the alternating current magnet core to prevent main contacts from dropping too far apart thus preventing the losing of the exciting current.

SPARKS—Current Facts, Figures and Fancy

(Catching grasshoppers, milking cows, and feeding chickens, is all done by machinery now; the idle wind has been set to work building roads, the correspondence between England and Cologne is so active that an air mail has been instituted, and the wireless telegraph systems in the United States handled about 450,000 messages during 1917. Only the rats seem to be unimpressed by the general anti-time-wasting movement.—The Editor.)

A tank car built by a European railroad for transporting living fish long distances has an electric motor which keeps the water aerated.

* * *

It is estimated that some 450,000 messages were handled during 1917 by the United States wireless telegraph systems—an increase of about 58 per cent over those for 1912. The total income for 1917 aggregated $1,385,060, a gain of 107 per cent over 1912.

* * *

It looks as though the cows in some countries have been affected by the prevailing epidemic of strikes: recent figures show that the United States exported 553,000,000 pounds of condensed milk in 1918 as against a normal 21,000,000 a few years previously.

* * *

Bricks can be almost as painful as shrapnel and for this reason an American city has provided its policemen with metal helmets similar to those worn in the trenches. This thoughtful action on the part of the city authorities is not intended to reflect in any way upon the dispositions of the inhabitants.

* * *

"He's from the country" ought to be uttered in tones of awed admiration these days. According to recent figures there are 118 applications of electricity on the farm; and there are at present in use in the United States some 5,000,000 motor cars, over half of which are owned and operated by the farming population.

* * *

Somebody harnessed a volcano for power purposes; the latest is making the wind build roads. In the New Mexican desert country a highway some nine miles long was recently constructed simply by making a trench through the sand, extending it down to the clay bottom and letting the desert winds do the rest.

* * *

A frost barrage was one of the weapons used in fighting the recent great oil-plant fire at Bayonne. When the flames were already threatening the entire plant, chemists emerged with an apparatus throwing a spray at a temperature far below zero between the flames and the piled-up oil barrels, effectively checking the fire and saving both life and property.

* * *

The air mail from England to Cologne is growing rapidly. It was inaugurated in the early part of this year with four aeroplanes carrying 25 bags of mail between them, and within three months over three thousand bags had been carried. Correspondence leaving Cologne one morning is delivered to all parts of England and Wales from Folkstone by the first delivery on the following morning.

* * *

Catching grasshoppers by vacuum-cleaner is a possibility suggested by the latest diversion of a middle-western farmer. This enterprising gentleman patrols his fields with a funnel device, like a megaphone on wheels, which inhales grasshoppers. A motor driven fan near the mouth creates suction which draws the grasshoppers down into a detachable box, and a revolving brush keeps the passage clear. The day's catch is turned over to the chickens.

* * *

Rats are sensational animals. We have heard of them being responsible for plagues, devouring several hundred dollars' worth of paper money, and doing other dramatic and expensive things; the latest claimant to fame has turned in a fire alarm by gnawing at the lead sheathing in a street cable system and causing an intermittent short circuit to earth. The fire brigade turned out with admirable promptness; their subsequent comments are not recorded.

* * *

The farmerette feeding a flock of chickens is a picturesque sight dear to the heart of the artist, but the modern poultryman is utilitarian enough to spoil it by feeding his chickens by machinery. Iron tanks are attached to the ceiling of the hen house, tapering almost to the floor. A time clock starts a motor which in turn revolves a short vertical shaft within the tank, opening the door at the bottom of it and dropping the feed onto a swiftly revolving paddle. This scatters the feed in all directions over a wide area. A mixing barrel on the floor above keeps the tanks supplied.

* * *

What is said to be the largest airplane engine in the world has recently been put under its first test at the "Sunbeam" Works at Wolverhampton, England. It is reported to be of 1,000 nominal horsepower, developing about 900 horsepower at normal working speeds. It was not run at full power on the first trial, and is now being dismantled for examination, after which it will be reerected for a full-power test. The engine has 12 cylinders arranged "V" fashion, and weighs less than 2 pounds per horsepower. Special airplanes are to be built to suit the engine, while it is also probable that it will be fitted to some of the later giant airships. It is stated that the biggest airplane engine previously made was an Italian production.

PERSONALS

E. M. Cutting, formerly Pacific Coast manager for the Edison Storage Battery Company with headquarters at San Francisco, has been appointed manager of the company's railroad department with headquarters at Orange, N. J. Mr. Cutting expects to leave the coast early in September to take up his new duties, for which his previous experience admirably qualifies him. Entering the employ of the Southern Pacific Company's signal department in 1888, he rose to the position of signal supervisor for the western division by 1897. In 1905 he was also given charge of the car-lighting on the Southern Pacific lines and in 1908 became engineer of train lighting, heating and ventilation. In 1912 he resigned to become Pacific Coast manager of the Edison Storage Battery Company. "Uncle Ed," as he is affectionately known from coast to coast, has always taken an active interest in electrical affairs, having been instrumental in initiating the movement which culminated in the Association of Railway Electrical Engineers, of which he was the second president, and also being a past president of the San Francisco Electrical Development League. While his many friends on the Pacific Coast will be pleased to learn of his newest advancement, they cannot but feel a deep regret at his withdrawal from the Pacific Coast field.

John R. Freeman, electrical engineer of Providence, R. I., is one of San Francisco's recent visitors.

J. J. Duffy, electrical engineer of Providence, R. I., is among recent eastern visitors to San Francisco.

V. S. McKenny of NePage-McKenny Company, electrical engineers and contractors, Seattle, is spending his vacation on Vancouver Island.

J. Sandberg, chief engineer, Stavanger Electric Power Supply of Stavanger, Norway, is inspecting the hydroelectric power plants of California.

H. H. Jones, general manager of the Consolidated Gas & Electric Company of San Diego, has recently been spending some time in San Francisco.

Philip Forve, president of the Forve-Pettibone Gas and Electric Company, Los Angeles, has been spending some time in San Francisco. Mr. Forve was accompanied by his wife and family.

T. Arosin, who has been engaged in power construction work in Portland, Oregon, has been transferred to Isleton, California, where he takes the position of station operator of the Great Western Company's plant.

J. J. Agutter of J. J. Agutter & Company, Seattle, electrical engineers and contractors, is attending the national rifle and revolver shoot being held at Caldwell, New Jersey. He is a member of the Washington team.

R. H. Dearborn, professor of electrical engineering at Oregon Agricultural College, has recently returned from an extended eastern trip on which he visited several large power plants with a view to gaining the latest ideas along this line.

Roy J. Heffner has been placed in charge of technical instruction for the Extension Division of the University of California. **H. H. Bliss**, familiar to readers of the Journal of Electricity as having this position, will in future confine all his activities to teaching and lecturing for the Extension Division.

J. C. Clark, professor of electrical engineering at Stanford University, will take a sabbatical year's leave of absence from the university in the employ of the General Electrical Company. He has gone east to spend the next few months in the Pittsfield works.

J. E. Crilly has resigned his connection with the National Conduit & Cable Company of California to become Pacific Coast representative of the Habirshaw Electric Cable Company. Mr. Crilly will make his headquarters with the San Francisco office of the Western Electric Company.

N. S. Braden, former sales manager, has just recently been elected vice-president of the Canadian Westinghouse Company, Ltd., of Hamilton, Ontario. H. M. Bostwick, assistant sales manager, has been appointed sales manager, to fill the vacancy created by Mr. Braden's promotion.

C. H. Talmage, local manager of the Western Electric Company, Salt Lake City, **C. B. Hawley** of the Intermountain Electric Company and **Randall Myer** of the Capital Electric Company, both of Salt Lake City, have been spending a short time in San Francisco on their way to attend the Jobbers' meeting at Del Monte.

Dr. T. M. Putnam, professor of mathematics and dean of the undergraduate division in the University of California, has been given the additional title of acting dean of the College of Letters and Science by the State University Regents. The position of dean of the College of Letters and Science, held by the late Prof. H. Morse Stephens, has been unfilled since his death on April 16.

Captain W. S. Wyche of the Second Engineers, U. S. A., has returned from overseas and rejoined the Arkansas Valley Railway, Light and Power Company, Victor, Colorado. Captain Wyche was twice honored for bravery in action. Once he was decorated with the Croix de Guerre with palm conferred by Marshal Petain, and once he received a special enlarged citation from General Pershing.

Dr. F. H. Newell, head of the Civil Engineering department of the University of California, and president of the American Association of Engineers, was the principal speaker at the state convention of Technical Engineers of Utah at their annual meeting held in Salt Lake City, August 14, 15 and 16. Dr. Newell has since been spending some time in San Francisco, where he addressed an engineering gathering on "The Engineer in Modern Life: His Needs and Ideals."

J. H. Moseley, formerly with the managerial staff of the Journal of Electricity and more recently a captain in the United States Signal Corps, has accepted a position with the American International Corporation, export organization, as New York manager of the G. Amsinck & Company of Mexico. In his recent work in the advertising department of the Western Electric Company, Mr. Moseley has accomplished some very excellent work in disseminating ideas of helpfulness to the contractor-dealer. One of his excellent articles entitled "Building with Advertising" will appear shortly in the columns of the Journal of Electricity.

Major Allen E. Ransom has joined the Westinghouse Electric International Company as special representative in the west coast of South America with headquarters at Valparaiso, Chile. Major Ransom, who was well known to Pacific Coast engineers as sales engineer with the Seattle office of the Westinghouse Company, and later with other machinery interests, has just returned from France, where as chief electrical engineer for the St. Nazaire base and later as major commanding the 137th engineer battalion he had a wide and varied experience.

Charles G. Du Bois has been elected President of the Western Electric Company, to succeed H. B. Thayer, who has resigned after 38 years of service to assume the presidency of the American Telephone and Telegraph Company.

After his graduation from Dartmouth College in 1891, Mr. Du Bois joined the Western Electric Company in New York, as a clerk in the accounting department. As Secretary of the Company, a position to which he was elected in 1898, Mr. Du Bois had the general supervision of the entire accounting system of the Western Electric Company, and in this connection was largely instrumental in working out and securing the adoption of the Company's first pension plan.

In 1907 Mr. Du Bois was transferred from the Western Electric Company to the American Telephone and Telegraph Company as its comptroller. In October, 1918, after having served for a period as comptroller for the American Red Cross, Mr. Du Bois rejoined the Western Electric Company as vice-president, which office he held until his accession to the presidency.

E. J. Fentress, formerly local representative for the Chicago Fuse Company at San Francisco, has joined the sales force of H. B. Squires Company.

Arthur B. Reynders, former director of production of the Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pa., has recently been made works manager of the company's East Springfield plant. Mr. Reynders has been with the Westinghouse Company since 1899. He is succeeded as director of production by A. E. Kaiser, who has been assistant to the director of production since 1912.

E. N. Brown, president of the Majestic Electric Development Company with headquarters in San Francisco, has just returned from a six weeks' trip through the East, and after discussing conditions with branch managers at Kansas City and Philadelphia, and spending some days in Washington, New York and other centers, anticipates continued uncertainties in most markets over prices and material supply, but feels warranted in making plans for a business this year of at the very least 100% increase over last year's business. This speaks pretty well for a California industry that has developed into a world-wide scope in a few years.

J. H. Fagg of the Pacific Gas & Electric Company, Stockton, Cal., and his family have been enjoying two weeks of camping and fishing in the Sierras. Mr. Fagg is here shown operating his own public utility installation and latest reports state that, while the utility is not as yet on a paying basis, he has a tremendous lot of enjoyment in this new business diversion during vacation days in the high Sierras.

Major Chas. E. Sholes, recently elected vice-president of the Edison Storage Battery Company, has returned to Orange, N. J., after presiding at a meeting of district managers on the Pacific Coast, held at San Francisco.

A LETTER TO THE PUBLIC POLICY COMMITTEE, N. E. L. A.

Gentlemen:—

As Chairman of the Public Policy Committee of the National Electric Light Association, I wish to discuss with the members of that Committee the policies deemed essential by me to be pursued during the coming year.

First and foremost, I am in sympathy with, and ready to stand back of all the plans which have been suggested by Mr. R. H. Ballard, President, and pledge myself to support him in his more than laudable effort to make his administration year a record one for the Association. I hope that the members of our Committee will assist Mr. Ballard in securing men of prominence in the industry for chairmen and members of several new general committees he is trying to organize to work out the big problems confronting us. These will require the thought of some of the best minds and work of the best men.

We of the West want the East to know us better. We want to expand the usefulness of the Association; we want it to be nation-wide in its influence.

The fundamental policies which must govern the attitude of public utilities should be alike. In my judgment this can best be accomplished through the suggestions made by our President, particularly with reference to the formation of Geographic Sections.

The methods of approach to the rate regulating bodies must be upon sound principles of equity. Individual opinions enforced through argument in special cases should not be permitted to raise questions inimical to the public utilities as a whole.

The East has never been appreciative of the necessities of water power development; it has been more or less inactive in support of Western needs and conditions. This condition must be remedied.

Standards should not be encouraged in one section of the country that might be detrimental to other sections. In this concert of action is necessary.

The Public Policy Committee should be a judicial body acting upon the general questions raised in the Association and coming through the avenues of the different committees. For that reason it should be closely in touch with the action of all committees, but more especially the Executive Committee, and should have intimate knowledge of what is being discussed and of the problems that concern each of the subdivisions of the organization. I have arranged with the President that copies of the minutes of the Executive Committee meetings will be sent to each member of the Public Policy Committee.

If ever there was a time in the history of our Association when to overcome the insidious working of antagonistic interests we should stand together, that time has now arrived.

National legislation and state legislation should be correlated with the needs of all states, so as not to form dangerous precedents. Matters of this kind can best be worked out through the agency of such a committee as the Public Policy Commitete.

I want each and all of you to pledge yourselves to a shoulder-to-shoulder campaign with our President. Like the West from which he comes, he is progressive, ambitious and resourceful.

I am sending a copy of this letter to you, to each of the vice-presidents, and invite from you and them such suggestions of matters to be considered at the meeting of the Public Policy Committee to be held in September as may occur to you as things that should receive consideration at the hands of that Committee in line with the policies which I have outlined in the preceding paragraphs.

Yours very truly,

JOHN A. BRITTON, Chairman.

Meeting Notices for Electrical Men

(An important item in this week's activities is the postponement of the Northwest Electric Light and Power convention, announced on page 229. The vacation period being now practically over, organizations are again very active, notably the National Electric Supply Jobbers' Association which has just held its quarterly gathering at Del Monte.—The Editor.)

American Institute of Electrical Engineers

The Pacific Coast Convention of the American Institute of Electrical Engineers, scheduled to take place in Los Angeles, California, September 18-20, 1919, will be held under the auspices of the local section, and vice-president John B. Fisken of Spokane, Wash., has accepted the invitation to preside at the convention sessions.

The program arrangements are not yet completed, but the following technical papers will be among those presented:

"Order and Amplitude of Harmonics in Voltage Wave Forms with Indicating Instruments," by Leslie F. Curtis.

"Theory of Probabilities Applied to Failures of Suspension Insulators," by L. M. Klauber.

"Predetermination of Synchronous Phase-Modifier Performance," by Hubert V. Carpenter.

"Operating Features of a 1000-Mile, 220,000-Volt Transmission Line," by R. W. Sorenson, H H. Cox and G. E. Armstrong.

In addition to this the Entertainment Committee also promises a splendidly arranged program. The whole convention will have distinct social attractions as well as vitally important technical features.

Committee on Railway Electrification, San Francisco A. I. E E.

The sixth meeting of the Committee on Railway Electrification was held on August 15th, 1919, at the Engineers' Club, San Francisco, California. Messrs. Woodbridge, Sibley, Fowler, Dodge (representing Mr. Ready), Jollyman, Baum and Cone were present.

Concerning a paper by Mr. R. Beeuwkes for the forthcoming Los Angeles A. I. E. E. convention, a letter was read from Mr. Beeuwkes. This letter sets forth the impracticability of publishing additional data of the Chicago-Milwaukee electrification for the present.

The question of a report by this committee to the September A. I. E. E. convention was then taken up. It was agreed that such report should consist of:

1. General section, giving an outline of the program of the Committee, with such items as can be obtained from the work of the several sub-committees, and

2. An illustrated paper on the water power resources of California, by Mr. Fowler, giving results of his work on the preliminary report of sub-committee No. 2.

It was agreed that if practicable the report for the A. I. E. E. convention would be published in the Journal of Electricity for September 15th, 1919. A motion was carried designating the chairman, vice-chairman and secretary as a committee in charge of the report.

The meeting adjourned to convene September 26, 1919, at 1:00 p.m. at the Engineers' Club.

A. I. E. E. Committee Appointments

At the first meeting of the Board of Directors of the Institute for the administrative year beginning on August 1, 1919, held in New York on Tuesday, August 12, 1919, President Townley appointed committees for the administrative year beginning August 1, 1919.

The Chairmen of the committees appointed are as follows:

Finance, N. A. Carle, Newark, N. J.; Meetings and Papers, W. I. Slichter, New York; Editing, Henry H. Horris, New York; Board of Examiners, F. L. Rhodes, New York; Sections, W. A. Hall, Lynn, Mass.; Student Branches, C. Francis Harding, Lafayette, Ind.; Membership, R. W. Krass, New York; Public Policy, H. W. Buck, New York; Headquarters, N. A. Carle, Newark, N. J.; Committee on Technical Activities, Wilfred Sykes, Pittsburgh; Standards, L. T. Robinson, Schenectady, N. Y.; Power Stations, Philip Torchio, New York; Transmission and Distribution, E. B. Meyer, Newark, N. J.; Traction and Transportation, W. S. Murray, New York; Industrial and Domestic Power, A. G. Pierce, Pittsburgh; Lighting and Illumination, C. E. Clewell, Philadelphia; Economics of Electric Service, William McClellan, Philadelphia; Protective Devices, D. W. Roper, Chicago; Electrochemistry and Electrometallurgy, E. F. Northrup, Princeton, N. J.; Electrophysics, F. W. Peek, Pittsfield, Mass.; Telegraphy and Telephony, Donald McNicol, New York; Marine, Arthur Parker, Camden, N. J.; Use of Electricity in Mines, W. A. Chandler, Uniontown, Pa.; Electrical Machinery, B. A. Behrend, Boston; Instruments and Measurements, S. G. Rhodes, New York; Iron and Steel Industry, W. F. James, Philadelphia; Educational, J. C. Parker, Ann Arbor, Mich.

In accordance with the by-laws of the Edison Medal Committee the Board confirmed the appointment by President Townley of three members of that committee for terms of five years each, namely:

Messrs Edw. D. Adams, New York; H. H. Barnes, Jr., New York; and Benjamin G. Lamme, Pittsburgh. The Board also elected three of its own membership as members of the Edison Medal Committee for terms of two years each, namely, Messrs. Wilfred Sykes, Pittsburgh; W. A. Hall, Lynn, Mass.; and G. Faccioli, Pittsfield, Mass.

BUILDERS OF THE WEST — LV

LEONARD F. FULLER

In no field of scientific achievement emphasized by the war have more epoch-making results been achieved than in the field of radio telegraphy. Spanning vast distances and revolutionizing intercommunication on land and sea, this science has opened up possibilities undreamed-of a few years ago, and has brought still nearer the pan-Pacific ideal of the West. To a western man goes the honor of having made the greatest single contribution to the development of long-distance transmission in radio telegraphy: to Leonard F. Fuller, therefore, whose work with the Federal Telegraph Company of Palo Alto, California, has won for him the highest academic honors as well as nation-wide recognition, this issue of the Journal of Electricity is affectionately dedicated.

San Francisco Association of Electrical Contractors and Dealers

In our issue of August 15th an account was given of recent proceedings of the San Francisco Association of Electrical Contractors and Dealers with quotations from the revised by-laws. This account, owing to an editorial error, appeared under the heading "California Association of Electrical Contractors and Dealers." We hereby extend our very sincere apologies to the local association and trust that this explanation will help to clear up any inconveniences which may have resulted from the mistake.

Oregon Association of Electrical Contractors and Dealers

The regular meeting of the Oregon Electrical Contractors' Association for District No. 1 was held in the executive offices Monday evening, July 28th. The meeting was called to order by Chairman Kenney at 8:10 p.m.

The question of officers and the position of secretary were discussed, the matter being left, however, in the hands of the Executive Committee.

The question of the advisability of trying to form a fixed opinion regarding prices of certain articles which were more or less standard came up for consideration. The policy was disapproved and the recommendation made that the Association confine itself to the discussion of costs, overhead and reasonable profit, permitting individual action in the matter of establishing a price on any and all commodities. Attention was called to the fact that possibly misunderstanding had arisen in connection with this and it was necessary to call the particular attention of all the members to this policy.

At the regular meeting held on August 11th, Chairman Kenney presiding, the roll call was as follows:

J. C. English Co.
Pierce Tomlinson Electric Co.
Jaggar-Sroufe Co.
Nepage McKenney Co.
E. L. Knight & Co.
R. N. Lewis Electric Co.
Portland Elec. Maintenance Co.
National Electric Co.
M. J. Walsh Electric Co.
Morrison Electric Co.
Scott Electric Co.
Vanderlip & Lord
F. A. Bauman & Co.
R. W. Larsen
Smith McCoy Electric Co.

The Executive Committee through R. C. Kenney, chairman, reported that H. C. Jones had been secured as secretary on a part time basis and that the headquarters office would be moved at once to 306 Concord Building.

J. R. Tomlinson, delegate to the National Convention at Milwaukee, gave a most interesting and instructive report regarding the things accomplished at the convention.

The application of R. W. Larsen for membership, 608 McKay Building, as a Class A member, was read and accepted.

A communication from Assistant Secretary of War, Arthur Woods, regarding citations for employers agreeing to reemploy army or navy men, was read and the secretary was instructed to apply for citations on behalf of the membership.

The labor problem was then taken up for discussion, principally the demand of the men for one dollar per hour. Mr. Green spoke in favor of submitting the labor proposition to the State Labor Conciliation Board and presented a resolution for discussion and signatures of members if approved. The resolution read as follows:

"We, the undersigned, electrical firms of the City of Portland, recognizing the necessity of paying an adequate wage to our employes, do hereby agree to submit the wage question to the State Board of Conciliation, agreeing likewise to abide by their findings."

It was moved, seconded and carried that the resolution be adopted by the Board, and that a committee of five with R. C. Kenney as chairman be appointed to handle the matter of labor adjustment and secure signatures of members not present. Mr. Kenney thereupon appointed the following on the committee: McCoy, Green, Sroufe and Fouch.

San Francisco Electrical Development League

The San Francisco Electrical Development League will resume its weekly luncheons this month. The first meeting will be on Monday, September 8, and it is hoped that there will be an especially large attendance.

California Association of Electrical Contractors and Dealers

A monthly meeting of the state Association of Electrical Contractors and Dealers was held on August 29th in San Francisco. Manufacturers and their representatives and jobbers and their salesmen were invited to attend this meeting.

Engineers' Club of San Francisco

At the meeting of August 21st John R. Freeman addressed the Engineers' Club of San Francisco on the subject of the Grand Canal of China.

The club had as its luncheon guest the following week Dr. F. H. Newell, president of the American Association of Engineers. Dr. Newell also addressed a gathering of San Francisco engineers on August 27th at the rooms of the Commercial Club. The title of his talk was "The Engineer in Modern Life: His Needs and Ideals."

CONVENTION POSTPONED

The Convention of the Northwest Electric Light and Power Association which was to have been held at Seattle September 10th to 13th has been postponed until September 24th to 27th. On account of the arrival of the fleet it will be impossible to secure accommodations in Seattle during the week of September 10th. Details of the Convention are given on page 230.

California Electrical Cooperative Campaign

From the meeting of the California Electrical Cooperative Campaign, held at Del Monte on August 21st, come the following notations:

K. E. Van Kuran, chairman of the Commercial Committee of the Pacific Coast Section of the N. E. L. A., is investigating the results accomplished by the California Electrical Cooperative Campaign, and will prepare a report for the central stations.

A. W. Childs, of the Southern California Edison Company, estimates that the solicitor campaign among the contractor-dealers in the southern part of the state has resulted in a saving to the central stations of $100,000. This Lee H. Newbert, chairman of the Advisory Committee, believes has been duplicated in northern California. These figures sounded startling, but still so convincing that A. Emory Wishon, president of the Pacific Coast Section of the N. E. L. A., suggested to Mr. Van Kuran that his committee might do well to investigate and report thereon.

The improvement of the contractor-dealer is also becoming evident in the large number of sales of electrical appliances. The Advisory Committee believes that an investigation of these will result in some startling figures. For that reason Chairman Lee H. Newbert has instructed a special committee composed of D. E. Harris, Robt. Sibley and Nathan A. Bowers to gather statistics on the volume of business done in California from the manufacturers and jobbers, for the information of the Campaign's many contributors.

At the present time the Advisory Committee is considering plans by which bonuses will be given by the contractors and dealers to their sales people for the obtaining of new business. It is the sense of the members of the Advisory Committee that the efficiency of any business can be materially increased if its sales people know that their prosperity is linked closely with the firm's prosperity, and that they are in a material way partners with the owner in making the business a success.

National Electric Supply Jobbers' Association

The quarterly meeting of the Pacific Division of the National Electric Supply Jobbers' Association was held at Del Monte during the past semi-monthly period, and though very small in attendance, proved to be one of the most helpful of these gatherings.

A sensible discussion took place along the lines of trying to forecast the possible rising or falling of cost of electrical apparatus or supplies for the coming six months period, and the discussion brought out the fact that in all probability the cost would remain the same or possibly be a little higher than in former months.

Business from all over the country, as reported by manufacturers' letters, appears to be very active and the outlook for the electrical industry is unusually promising for the months ahead.

Those in attendance at the gathering were as follows:

Nathan A. Bowers, Pacific Coast Editor McGraw-Hill Company, San Francisco
T. E. Bibbins, president Pacific States Electric Company, San Francisco
H. L. Harper, Los Angeles manager Western Electric Co., Los Angeles
C. B. Hawley, Intermountain Electric Company, Salt Lake City
Albert Elliot, secretary Pacific Division National Electric Supply Jobbers' Association

G. E. Arbogast, president Southern California Association of Electrical Contractors and Dealers, Los Angeles
H. D. Randall, president Capital Electric Company and local manager, General Electric Company, Salt Lake City
M. A. De Lew, president California Association of Electrical Contractors and Dealers, San Francisco
R. M. Alvord, local supply manager General Electric Co., San Francisco
A. W. Childs, superintendent of sales, Southern California Edison Company, Los Angeles
C. B. Hall, manager Illinois Electric Company, Los Angeles
K. E. Van Kuran, Los Angeles district manager of Westinghouse Electric & Manufacturing Company, Los Angeles
Robert Sibley, editor Journal of Electricity, San Francisco
A. E. Wishon, assistant general manager San Joaquin Light & Power Corporation, Fresno
L. H. Newbert, manager commercial department, Pacific Gas & Electric Company, San Francisco
D. E. Harris, sales manager Pacific States Electric Company, San Francisco
Miles Steel, Pacific Coast manager Benjamin Electric Manufacturing Company, San Francisco
H. E. Sanderson, Pacific Coast manager Bryant Electric Company, San Francisco
Garnett Young, president Garnett Young Company, San Francisco
C. C. Hillis, Pacific Coast manager Electric Appliance Co., San Francisco
W. S. Berry, Pacific Coast sales manager Western Electric Company, San Francisco
Howard Angus, secretary California Electrical Cooperative Campaign
C. H. Talmage, Salt Lake district manager, Western Electric Company, Salt Lake City
F. J. Zorn, Seattle manager Pacific States Electric Company, Seattle
M. L. Scobey, manager Home Electrical, San Francisco
Frank Airey, Los Angeles manager Pacific States Electric Company, Los Angeles
W. C. Wurfel, Pacific Coast manager Westinghouse Lamp Company, San Francisco
Jim Pomeroy, manufacturer's agent, Los Angeles
J. M. Kemp, attorney-at-law, Los Angeles
C. E. Listenwalter, Listenwalter & Gough, Los Angeles
W. R. Dunbar, Electric Ry. Mfrs. & Supply Co., Los Angeles
F. H. Murray, National Carbon Company, Los Angeles
H. L. Bargion, Fobes Supply Co., Seattle
C. E. Heise, San Francisco district manager Westinghouse Electric & Manufacturing Company, San Francisco
Geo. A. Boring, Portland manager Pacific States Electric Co., Portland
W. B. Sawyer, U. S. Steel Corporation, San Francisco
Walter Seaver, in charge wire division, U. S. Steel Products Co., San Francisco
C. Z. Yost, Electrical Engineer, San Francisco
Earl Alexander, Alexander & Lavenson Co., San Francisco

The golf cups as always were keenly contested. The famous Jobbers cup went to Earl Alexander of the Alexander & Lavenson Company of San Francisco, the baby member of the Jobbers' Association. Mr. Alexander also carried off the Pass & Seymour cup and the Hotel del Monte cup. R. M. Alvord, local supply manager of the General Electric Company in San Francisco, was the winner of the Manufacturers' cup, while the Turner Trophy cup was won by Willis Dunbar of the Westinghouse Electric & Manufacturing Company.

Northwest Electric Light and Power Association

(Since this program was outlined the date of the convention has been changed as elsewhere announced. The dates of the various events as recorded here will of course be changed to correspond. —The Editor.)

The annual convention of the Northwest Electric Light and Power Association will be held in Seattle, September 10th to 13th, 1919. The business meetings will be held at the Press Club Hall, 1311 Fifth Avenue. A most interesting program has been prepared and a large attendance is expected.

On Wednesday, September 10th, the morning session will be devoted to routine affairs. At the afternoon session the Technical Committee Report, by G. E. Quinan, chairman, and a paper on Accounting, by J. S. Simpson, will be presented. There will be ample time given for discussion on both papers.

At 8 o'clock in the evening an illustrated lecture by Dr. W. H. Eastman will be given to the members and delegates present and invited guests. This will be an intensely interesting chronicle of electrical events during the war period, and we are assured that information will be presented that is unknown to the majority of the men in the electrical industry. Things brought out by stress of war will be dwelt upon, together with a large number of most interesting investigations along electrical lines.

Thursday morning a paper on the Value of Public Utility War Experiences and their Effect on the Future, by W. H. McGrath, will be presented, and in the afternoon a paper on Industrial Electric Heating, by C. A. Winder, will be given.

Friday will be devoted to round table conferences. In the morning one on Improving Electrical Merchandising will be led by W. R. Putnam and L. A. Lewis, and in the afternoon one on Ranges and Water Heaters, led by A. C. McMicken. It is hoped that these conferences will bring forth much discussion and it is anticipated that a great deal of interest will be evidenced in these two very important subjects.

Election of officers will take place Friday afternoon, followed in the evening by the annual banquet, at which time a paper on "Reminiscences" by W. J. Grambs, who has been in the electrical industry since its beginning on the coast, will be presented.

Much entertainment has been provided for in the way of theater parties, trips to Snoqualmie Falls, luncheons, and on Saturday morning a golf contest for a cup which is to be played for annually, and other interesting features which should afford plenty of diversion during the convention.

H. J. Gille is president, and W. E. Herring, Electric Building, Seattle, is secretary of the Association.

N. E. L. A. Committee Appointments

The following announcements are made by President R. H. Ballard relative to committees of the National Electric Light Association:

S. M. Kennedy, general agent of the Southern California Edison Company, has accepted the chairmanship of the Committee on Service to present the subject to the Pacific Coast Convention next year. Mr. Kennedy is the author of several papers along this line delivered and published in the past, including "The Man in the Street" and "Courtesy as an Asset."

John F. Gilchrist, vice-president of the Commonwealth Edison Company, Chicago, Ill., has accepted the chairmanship of the Committee on Public Information, which is a new General Committee.

The work will be organized by establishing in each state or geographic section a local committee which will finance itself, and will furnish new bulletins to the press. Recommendations for appointment as members of the general committee of men selected as chairmen of committees in the various states will be made by Mr. Gilchrist to the president for his approval and for action by the Executive Committee.

The committee will be very large, but as it is unlikely that as an entirety it will ever be called upon to meet together, this will not be objectionable.

Mr. Gilchrist was instrumental in starting a movement along these lines in the state of Illinois which has proven very successful, and the thought is to extend this to all states in the Union so far as company members in the several states desire such assistance.

Franklin T. Griffith, president, Portland Railway Light & Power Company, Portland, Oregon, has accepted the chairmanship of the Committee on Water Power Development. This committee is being organized to investigate and encourage water power development, and is the first general committee on this subject which the Association has had.

Mr. Griffith will associate with himself prominent executives from all Pacific Coast companies interested in the subject and some executives from eastern companies.

Lee H. Newbert, Pacific Gas & Electric Company, San Francisco, has accepted the chairmanship of a Committee on Cooperation in the Industry, to prepare a report on this subject. This committee will present the subject at the Pacific Coast convention from the standpoints of central stations, manufacturers, jobbers and contractor-dealers, showing how they can work together for the general good of the industry, what should be done from day to day along these lines in the ordinary course of the day's work, and the important place that each branch of the industry occupies.

Mr. Newbert will use for his guide the experience of the California Electrical Cooperative Campaign which was developed in the Pacific Coast Section, and of which Mr. Newbert has been chairman for several years. This committee will include representatives from all branches of the industry.

Illuminating Engineering Society

A tentative list of subjects to be covered at the 1919 convention of the Illuminating Engineering Society at Chicago, October 21 to 24, has been announced by the papers committee. The committee on programs will review lighting developments during the war including, if possible, some of the new things which heretofore have not been openly discussed. Searchlights, their development and application during the war, will be another interesting feature.

A paper on "Viaduct Lighting" will describe an installation made without poles and involving an unusual and interesting method of distributing light over the roadway with provisions for reducing glare. Recent developments in equipment and applications of electric street lighting will also be discussed.

For the industrial man there will be a paper entitled "Industrial Lighting" which will give data and descriptions of good installations recently put in under the advice of experts of important central stations.

State experts will give their experience in applying and enforcing industrial lighting; the importance of insuring industrial safety by means of wide regulations will center much interest on this topic; a message from the merchandiser to the illuminating engineer will be included in a paper entitled "Illuminating Engineering and Merchandising."

A. I. E. E. Committee on Development Report

(The A. I. E. E. Committee on Development was appointed in October, 1918, to consider modifications in the field and methods of work of the Institute. The following is extracted from the Committee's report presented on August 12th of the present year, and embodying the results of discussion during the recent convention at Lake Placid.—The Editor.)

There is an almost unanimous view that the Proceedings published by the A. I. E. E. do not seem sufficiently to interest the membership at large, and the suggestions of a remedy cover a wide range of possibilities. The value of the class of papers which heretofore have been published in the Proceedings as representing advances in the art and constituting a record of progress is appreciated and it is insisted that the high standard of the Institute should be maintained, but it is believed that this view is not inconsistent with a recognition of the rights of 90%, or perhaps 95%, of the total membership who are concerned with the day-to-day engineering problems and with the personal side of engineering relationships. It is believed that if the Proceedings can be properly expanded that publication will serve better both to bind the present membership closer together and furnish an added incentive for engineers not already members to join. The Development Committee feels that further study should be given to this matter in order that the very best plan may be adopted.

Publication —

It was recommended that the Publication Committee be asked to consider improvements in the present plan of publishing the Proceedings and the Transactions and of printing and distributing copies of Institute, Section and Branch papers.

That in dealing with these questions the Publication Committee consider:

a. Enlarging the editorial and executive publication staff for the purpose of expanding the Proceedings to contain additional live matter of interest and value to the membership as a whole without giving less importance to the principal activities of the Institute, i. e., the promotion of the fundamental advance in the art and the encouragement of original investigation in the field of electricity.

b. Publishing all Institute papers and occasional papers of unusual broad general interest and value from Sections or from other sources; publishing a set of abstracts of every paper presented to every Section so that each month there will be a complete record of this class of Institute activity.

c. Eliminating as far as may be feasible the duplication of expense now incurred by twice publishing the papers heretofore distributed (in both the Proceedings and the Transactions) but without depriving the membership of the Transactions in some form.

d. Publishing discussions in the Proceedings.

e. Endeavoring to increase the revenue producing capacity of the Proceedings by expanding its advertising policy and if necessary changing its page dimensions.

f. Printing pamphlet copies of some or all Section and perhaps Branch papers and economizing on the cost of printing Institute and such Section and Branch papers by limiting their quantity and free distribution while making them available for the membership.

Organizations and Activities —

Another unanimous desire of the membership is for closer contact between the Institute officers, prominent engineers and the Sections as a means of improving the morale of the organization, stimulating Section activities and of interesting the membership at large, particularly the younger members in Institute work. With the large number of Sections and Branches now in existence and the probability that this number will increase, it seems obvious that if the present Institute officers were to comply with this demand they would have time for nothing else and even then the demand would not be satisfied. An obvious alternative therefore is to have more officers and let them be chosen from different parts of the country. If this be done and these officers are to be really participants in the Institute management and not simply visiting functionaries, means must be provided to insure their attendance at Institute and Board meetings. It is believed that these objects can be accomplished by decreasing the number of Institute meetings, thereby reducing the demand of the time of its officers by holding them in different parts of the country, thus making it easier for those residing at points remote from headquarters to attend and by paying the expenses of Board members when in attendance. If the Institute meetings be not held in New York it almost naturally follows that the New York members, constituting a very large and important per cent, should organize a Section so that their present opportunities may be expanded instead of abridged.

In order to accomplish the results described, the Committee makes the following recommendations:

(a) That a New York Section be organized and conducted on the same lines as existing Sections elsewhere.

(b) That the present practice of holding some of the Institute and Directors' meetings in different localities, where local Sections are established, be extended, instead of holding nearly all of these meetings in New York as at present. It may be desirable to reduce the frequency of Institute and Directors' meetings and to hold them every two months or perhaps even less frequently, instead of every month as now.

(c) That the country be divided into geographical divisions corresponding in number to the number of Institute vice-presidents. If more than six divisions should be thought desirable, they should be established and the number of vice-presidents increased to correspond. In order to allow for the future shifting of membership density and at the same time to escape the necessity of cumbersome constitutional amendments the number and delimitation of geographical divisions should be specified in the by-laws instead of the constitution, to provide for ready amendment by the Board of Directors.

(d) That one vice-president be selected from each geographical division, the president and managers to be elected from the membership at large as at present.

(e) That the Institute should pay the traveling and living expenses of the officers and Board members when attending Institute meetings.

(f) That it be the duty of each vice-president to visit each Section in his own division at least once a year, the Institute to pay his traveling and living expenses for such visits. Of course it would be desirable if the vice-presidents could exchange visits.

(g) That the vice-presidents' term of office be lengthened from one year to two years and the constitutional inhibition against the

A. I. E. E. DEVELOPMENT COMMITTEE ACTIVITIES

By J. C. Clark

Retiring Chairman of San Francisco Section, A. I. E. E.

For some years there have been clear indications that a considerable number of members of the American Institute of Electrical Engineers earnestly desire changes in the functioning of the Institute—particularly in the Proceedings. It was in response to such desire that last winter Past-President Adams appointed a "Development Committee" headed by Mr. Calvert Townley. In general, this committee functioned admirably and succeeded in gathering from the membership and submitting to the Executive Committee of the Development Committee a number of very interesting and valuable suggestions. Chairman Townley ably digested these suggestions, and presented them at the sessions of the Development Committee during the recent Annual Convention of the Institute at Lake Placid Club, New York, which the writer attended as Development Committeeman for the San Francisco Section and Delegate of that Section. For a report of these sessions, see Proc. A. I. E. E., July, 1919, pp. 253-255.

There is certainly very urgent need of an improvement in the selection of papers printed in the Proceedings. While it is to be conceded that every worthy electrical engineer ought to join the Institute as a matter of loyal support to that body, and in order to identify himself with the national organization of his profession, yet he has a perfect right to expect that the Proceedings shall contain articles of general interest to the majority of electrical engineers. In recent months, there have appeared in the Proceedings a number of papers which have had little or nothing to do with electrical engineering. As an example of such papers, consider the one in the July Proceedings entitled "The Absolute Measurement of Sound." Just why this entertaining account of pure physical research appears in the Proceedings of the Electrical Engineers instead of, say, the Physical Review, is a profound mystery. Does our Institute's Meetings and Papers Committee operate with any clearly understood policy regarding its selection of papers? It appears not.

Certain prominent members of the Institute have objected strenuously and with justice to any "lowering of the high standards of the Institute." Such lowering would indeed be a calamity, but the writer believes that the inclusion of real engineering matters, together with the advanced technical papers in the Institute Proceedings could not possibly be construed as a lowering of standard. On the other hand, there should be no trespassing by the Proceedings upon the recognized field of our technical press either in popular descriptive articles, current news, or advertising. In these ways, our technical journals perform invaluable service for the profession, and the industry, and their position should not be weakened by any uncalled-for competition on the part of the Institute.

election of a vice-president as manager be removed. Provide against too extended tenure of office by a constitutional provision that, except in the case of a manager or a vice-president, who may be elected president, no member may continuously hold office longer than six years.

In the matter of Activities the following recommendations are made:

(a) That committee work be decentralized as far as it may be found feasible and desirable by substituting Section committees for Institute committees. Appoint a general committee to study this question and make recommendations.

(b) That more high grade papers of general engineering interest be presented.

(c) That a committee be created in each Section charged with the duty of assigning to the younger members specific participation in designated meetings by the preparation of papers, discussion or otherwise. It is hoped by this means and by the appointment of a reasonable number of the younger men to the larger committee membership caused by decentralization, that the interest of the younger men will be stimulated, and their loyalty increased.

Local Federation and National Council —

There is a universal recognition of the fact that engineers do not participate as actively or as prominently in public affairs as they should and that both the public welfare and their own individual advancement would be promoted if this condition could be rectified. There are two general reasons believed to be responsible for the existing condition, one a lack of any general organization of engineers which would facilitate their cooperation, and second, too great technical specialization in the engineering curricula of our technical engineering student and start him on his career with an exaggerated idea of the importance of specialization and an insufficient appreciation of the part he must play in public affairs.

It was felt that the Institute could properly take a constructive step by adopting a skeleton plan for cooperation and then appoint conferees who could discuss the matter with similar conferees from other societies, and endeavor to agree to definite recommendations to their respective governing bodies. With this object in mind the Committee recommends:

(a) That a comprehensive but flexible uniform outline for the federation of local engineering bodies be prepared, taking advantage of the experience already gained by existing affiliations.

(b) That we use our endeavors to have the other national societies establish and support local Sections along lines similar to ours but do not confine local federations to such branches, rather planning to include all the worthy engineering bodies.

(c) That wherever such federations can be organized there be established under an appropriate name a federated local council of engineers to be made up of a properly apportioned number of representatives from the different locals.

In order to link up the local federations the Committee recommends:

(a) That there be established a direct touch between each local federated council and a National Engineering Council composed of delegates from as many National engineering societies as are willing and worthy to participate.

(b) That through the medium of the National and the local federated councils there be perfected a working arrangement for engineering cooperation in all public affairs where such is desirable.

Engineering Congress —

It is also recommended that there be inaugurated the custom of periodically holding an Engineering Congress, the delegates to which should be selected from all parts of the country under a plan to be developed for suitable representation, this Congress to consider and take action on such matters of general interest to engineers and to the public as may merit its attention and as have been previously advertised, for a sufficient length of time, to permit locals everywhere to give them consideration and when possible to send instructed delegates.

Education of Engineers —

It was the unanimous view of the members attending the sessions at Lake Placid that the matter of a possible modification of the engineering curricula in the technical schools and colleges should receive early and thorough consideration by the Institute. Following is an extract from the resolution which was there presented and adopted:

"This Committee would welcome the establishment at the earliest date practicable of a normal six years' collegiate course in engineering, two years of which at the least would be devoted to training in the humane arts and sciences including, for example, Political Science, Economics, History and General Letters; the last four years being devoted to sound training in the sciences and in only the fundamentals of diversified engineering.

With or prior to such a development we would endorse a program for the marked extension of vocational training in the industrial centers in order that the needs of industry may be met.

To the accomplishment of these ends this Committee requests the appointment of representatives to serve on a Joint Committee of Engineering Organizations to promote such a national educational program as shall provide for the future necessities of the engineering profession consistent with the needs of society."

While the Board did not specifically instruct the Development Committee to confer with similar Committees from the other National Engineering Societies, the Chairman was informally advised by the President that where such conferences could expedite and help to crystallize the viewpoint of the several organizations concerned without committing the Institute to any line of action they would be desirable.

HAPPENINGS IN THE INDUSTRY

REMODELING PLANT

The St. Joseph Railway, Light, Heat and Power Company of St. Joseph, Mo., are installing a new turbine in their steam plant. The turbine is of 12,500-kva. capacity, and is supported by a concrete foundation which extends down 70 feet to bedrock. The entire plant is being remodeled and equipped for oil burning. Hammel burners will be installed. One-half of the plant was formerly oil burning but was changed to coal in 1918, due to the shortage of oil. An oil bay of 120,000 bbl. capacity is under construction between the plant and the Missouri river. The steam capacity of the plant will be increased by the installation of two 1000-hp. Bigelow Hornsby boilers, and two new smoke stacks of 16 ft. and 12 ft. in diameter, each 260 ft. high.

THE PETROLEUM SITUATION

There is at the present time a world-wide interest in the oil situation. This has been induced as a result of the war calling attention very strongly to the need of petroleum and its products, both in a military and commercial sense. These products are, principally: gasoline for automobiles, farm tractors, trucks, aeroplanes, motor boats, etc.; fuel oil for marine propulsion, metallurgical processes, and internal combustion engines of the Diesel type; and lubricants for all machinery.

During 1918 some thirty-eight million barrels of oil were imported from Mexico. Imports have been greatly increased during the first half of 1919 and they can be still further extended, according to the need of the United States, as it is chiefly a matter of demand and transportation. A great deal of interest is being displayed in establishing refineries on the Gulf Coast of the Atlantic seaboard to handle Mexican oil, the intention being to export Mexican oil and take off the gasoline and other desirable products, selling the residuum for fuel oil. A number of refineries for this purpose are being established.

At the present time the principal domestic source is in the Mid-Continent field which extends from Kansas through Oklahoma into northern Texas and Louisiana. This district is producing more than a half-million barrels of oil daily—more than half the total production of the United States. This oil averages above the rest of the country in quality and the proportion of gasoline obtained from this district is be-

tween 60% and 70% of that obtained from the total production of the United States.

Prospecting is going on extensively in Arizona, New Mexico, Utah, Montana and other states. In California, considerable new territory of great promise has been recently developed in the southern part of the state and in the Elk Hills district in Kern county.

The daily average production of gasoline during the month of May was, in 1917, 7,703,749 gallons; in 1918, 10,302,942 gallons; in 1919, 11,434,593 gallons. Gas and fuel oil stocks have increased from 515,000,000 to 789,000,000 gallons.

Active steps are being taken to establish a wider market for fuel oil, and it is at the present time competing very actively with coal for steam generation along the Atlantic seaboard, particularly in New England. It is anticipated that the completion of the refineries for handling Mexican oil on the Atlantic seaports will induce still stronger competition with coal in our seaports.

NEW FOREIGN CABLE

The National Foreign Trade Council has embarked upon a determined effort to secure substantial improvement of American facilities for cable and wireless communication across the Pacific Ocean. The council has appointed a special committee on foreign communications, which is taking up the subject energetically, with a view to securing prompt and effective action.

The final declaration of the Sixth National Foreign Trade Convention called for the establishment of American systems of cable and wireless as a national trade policy and pointed out that world trade can be handled only with facilities for telegraphic communication to all foreign countries.

The convention recommended that this national trade policy should be carried into effect first in those places where present service has proved inadequate, as in the case of the single cable that forms the only direct communication between the United States and the Orient.

NEW TRANSMISSION LINE

The public Service Company, Aurora, Nebraska, is building a 33,000-volt transmission line from Aurora to a point six miles west, thence northwest seven miles to Phillips. A branch line at 6600 volts will also be run to Giltner. No. 2 aluminum conductor is being used. To supply power to this new line the Central Power Company is constructing a 33,000-volt line from Grand Island to Phillips.

POWDERED COAL IN NEW MILL

Powdered coal is to be used throughout for firing boilers and furnaces in the new sheet mill of the Falcon Steel Company now being erected at Niles, Ohio.

The power plant boilers will be powdered-coal fired, using the Quigley Compressed Air System for transporting and burning the coal. The pulverized coal will be transported from the milling plant through standard four-inch diameter wrought pipes to furnaces and boilers for various distances aggregating approximately eight hundred feet, and will be switched from the main distribution line to a storage bin in the power house for use as required for the boilers. The contract for the complete equipment for preparing, distributing and burning the fuel has been awarded the Quigley Furnace Specialties Company, of New York.

GREAT WESTERN POWER COMPANY'S ISSUE OF STOCK

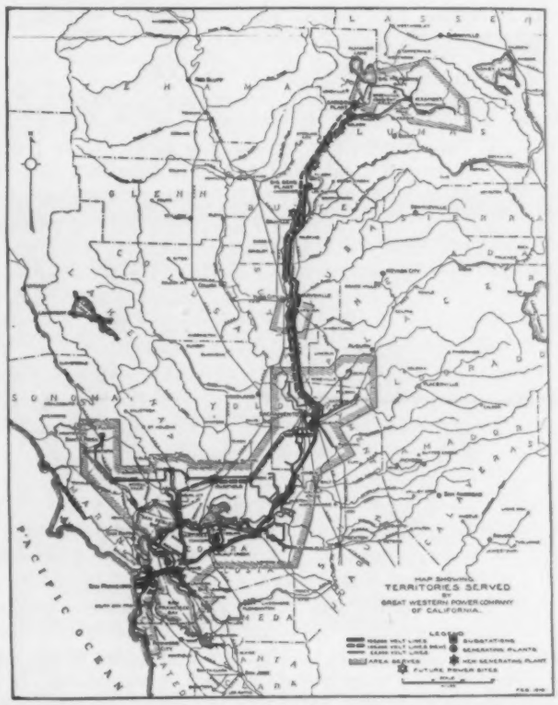
The Great Western Power Company of California is constructing a new hydroelectric generating plant of an initial capacity of 53,000 horsepower which will increase the installed hydroelectric generating capacity of the company to 140,000 horsepower, and a new 165,000-volt steel tower transmission line from this plant to Valona, the distributing center for the San Francisco bay district. This construction program of the company is to be financed from the proceeds of the $1,500,000 preferred stock and $6,000,000 in bonds, which have been authorized by the Railroad Commission of California. It is estimated that the transmission line will be completed early in 1920 and the new hydroelectric plant early in 1922. This increase in the generating and transmission capacity of the company is urgently required by the increasing demand for electricity in the territory now served by the distributing system of the company.

The development of California has been and will in the future be largely predicated upon hydroelectric power. Industry, agriculture, transportation, and indirectly, through the release of fuel oil, trans-pacific and Central and South American commerce, no less than the general demands of public service, are dependent upon the the water powers of the state.

A recent report on the central California power market by a representative of the Power Division of the War Industries Board discloses a present excess of over 30,000 horsepower of demand over supply, and a normal increase in demand of over 25,000 horsepower a year.

In the past six years the connected load of the Great Western Power Company has increased from 135,000 horsepower to about 280,000 horsepower and the number of customers served from about 12,000 to 27,000.

The present hydroelectric plant of the company at Big Bend, about 50 miles down-stream from Lake Almanor, with an installed capacity of 87,000 horsepower using the water at a head of 420 feet, has been in successful operation since 1909. The company is now constructing a second plant, to be known as the Caribou plant, at a point about 10 miles from Lake Almanor, which will use the waters at a head of 1,075 feet. This plant will have an initial installed capacity of 53,000 horsepower. The initial hydraulic development will permit increasing the capacity to 80,000 horsepower and duplicate tunneling will eventually raise the capacity to its ultimate maximum of 160,000 horsepower at an estimated cost of about $60 per horsepower.



Map showing the territories served by the Great Western Power Company of California, the voltage of the various lines, and the substations and generating plants of the system. The announcement of a new issue of stock has directed special attention to this company's activities.

THE ELECTRICAL UTILIZATION SAFETY ORDERS

There has been some doubt in the minds of those who install electrical equipment as to whether the Electrical Utilization Safety Orders are simply advisory in character, or whether their purpose is to set reasonable standards for safety and make compliance with such standards obligatory. Furthermore, it does not appear entirely plain to many that these Orders, instead of being drafted by the California Industrial Accident Commission or its staff, were drafted by a committee appointed by the industrial, technical and labor organizations.

Attention is directed to the following sections of the Workmen's Compensation, Insurance and Safety Act of the State of California:

"Sec. 38. The commission is vested with full power and jurisdiction over, and shall have such supervision of, every employment and place of employment in this state as may be necessary adequately to enforce and administer all laws and all lawful orders requiring such employment and place of employment to be safe, and requiring the protection of the life and safety of every employe in such employment or place of employment.

"Sec. 39. The commission shall have power, after a hearing had upon its own motion or upon complaint, by general or special orders, rules or regulations, or otherwise:

(1) To declare and prescribe what safety devices, safeguards or other means or methods of protection are well adapted to render the employes of every employment and place of employment safe as required by law or lawful order.

(2) To fix such reasonable standards and to prescribe, modify and enforce such reasonable orders for the adoption, installation, use, maintenance and operation of safety devices, safeguards and other means or methods of protection, to be as nearly uniform as possible, as may be necessary to carry out all laws and lawful orders relative to the protection of the life and safety of employes in employments and places of employment.

(3) To fix and order such reasonable standards for the construction, repair and maintenance of places of employment as shall render them safe.

(4) To require the performance of any other act which the protection of the life and safety of employes and places of employment may reasonably demand."

NEW PLANT

The Beatrice Power Company is constructing a new plant on the Blue river at Barnston, Neb. A dam across the river will give a head of 18 feet which will be utilized through vertical turbine type water wheels directly connected to the generators. Two units of 425-kva. each will be installed. The dam will be of reinforced concrete, having a 250-ft. concrete spillway. The four tender gates 13 by 24 ft. will be operated by electric hoists.

A new 33,000-volt line, 23 miles in length, will be built from Barnston to Beatrice via Holmesville, replacing the present line from Holmesville to Beatrice.

AWARDS TO EMPLOYES

The Holtzer-Cabot Electric Company of Roxbury, Mass., presented $100 to every man and woman who had been in the employ of the company for ten years or more. Over 700 are employed in the electrical plant and more than 25% were the recipients of this welcome bonus. The company has a very enviable record in regard to its men. Where other manufacturers are bewailing the high cost of employing new help and the losses in labor turn-over, the Holtzer-Cabot Company is fortunate enough to have one of the smallest labor turn-overs in New England. The Factory Management Committee works along modern lines with the several shop committees and this works out to the mutual advantage of the management as well as the employes.

ELECTRICAL COMPANY'S NEW BUILDING

A unique structure which bids fair to be a landmark is the new building of the Toledo Railways & Light Company in Toledo, with its gorgeous lighting scheme. The exterior decorative effect is Japanese wistaria vine in three shades of purple lavender, moss and canary greens, adorned with colored butterflies and huge peacocks. There will be 15,000 10-watt lamps in the outlining alone, and the entire cornice from the fifth floor up will be flood-lighted by a battery of searchlights, which will make it visible from every part of the city.

The decorations on the street floor, where there will be a large electrical display, will be all in orange. Over the main entrance will be two large electric signs fitted with letter slides to announce sales.

INSURANCE OF EMPLOYES

A large group contract went into effect on July 31 when all the employes of the National Lamp Works of the General Electric Company came under the protection of the Travelers Insurance Company. These employes occupy several plants and are estimated at 11,000 in number.

As the amount per capita is between $500 and $1,000 nearly $10,000,000 life insurance is involved. Each employe who has been with the company for three months is to receive $500 life insurance. Those who have been with the company one year will receive $600 and from that time on one hundred dollars will be added each year until the amount reaches $1,000.

TRADE NOTES

High Tension Insulators —

The Westinghouse Electric & Manufacturing Company are going very extensively into the manufacture of insulators for high tension service. A separate plant has been established and a corps of engineers highly skilled in this class of work employed. A very high grade of insulator for high tension work is being produced in large quantities by this company.

A large order for high tension insulators was recently given the Westinghouse Electric & Manufacturing Company by the Southern California Edison Company for their long-distance 150,000-volt transmission system.

Electric Furnace Order —

The Electric Furnace Construction Company, Finance Building, Philadelphia, report an order received from a new steel casings plant—the Dodge Steel Company, Philadelphia. The installation will be a 3-ton furnace of the latest "Greaves-Etchells" type.

Contract for Transformers —

The contract for all distribution transformers used by the city of Los Angeles during the next year has been awarded to the Moloney Electric Company of St. Louis through their Pacific Coast representatives, the Garland-Affolter Engineering Company. This adds another system to the list of Moloney transformer users on the Pacific Coast. Garland-Affolter also report good business in Moloney transformers from many lighting and power companies throughout the West.

New Office Opened —

The Acme Wire Company of New Haven, Conn., announce that due to the increasing volume of their business in the middle west and the desirability of keeping in closer and more frequent touch with the requirements of their customers, they have opened an office in Cleveland, Ohio.

Their sales representative is Mr. J. T. Crippen, the office address is No. 521 Guardian Building, and the telephone number is Main 2024.

The step taken by the Acme Company will undoubtedly result in a closer and more effective association with their many friends in the middle west.

New Company —

The Standard Transformer Company of Warren, Ohio, has been incorporated under the state laws of Ohio for the purpose of manufacturing a complete line of bell ringing transformers. They have consummated an agreement with the Packard Electric Company of Warren, whereby they will in the future manufacture the bell transformers placed on the market by the Packard Company about six years ago.

Water Wheel Contract —

Wellman-Seaver-Morgan Company of Cleveland, Ohio, have been awarded the contract for two 28,000-hp. Francis type water wheels to be installed in the San Francisco No. 2 plant of the Los Angeles Aqueduct system. These wheels will operate under a head of 530 feet.

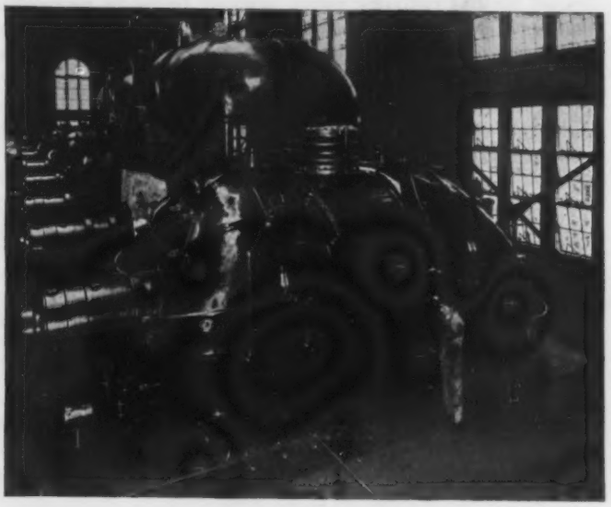
LATEST IN EVERYTHING ELECTRICAL

(An automatic ore unloader which reduces labor and supervision to a minimum, and which is already being successfully operated on a large scale, is among the electrical devices of interest described here. Other items are a large new turbine with special features, and a new line of bell ringing transformers.—The Editor.)

A NEW TURBINE INSTALLATION

The Interborough Rapid Transit Company, New York, has recently placed in operation at its 74th Street Power House, a Westinghouse turbine that is remarkable for two reasons.

It is, in the first place, rated at 60,000-kw. capacity continuously, and 70,000-kw. for two hours; so it is, therefore, the most powerful prime mover in the world.



Close-up view of Westinghouse 70,000-kw. triple compound turbine, the largest in the world. The total steam consumption at full load is 826,000 lbs. per hour.

Secondly, it has three elements, one high-pressure and two low pressure, and it is the first triple cross-compound turbine to be placed in operation.

The new unit occupies a floor space of 52 by 50 feet and is about 19 feet high. The big pressure element receives steam at 205 lbs. gauge pressure, and superheated 150° F., and it exhausts into the low pressure elements at 15 lbs. gauge pressure. The two low pressure elements are identical in construction, and each receives one-half of the steam from the high pressure element and exhausts it into the condenser where a 29 in. vacuum is maintained. All three elements operate at 1500 r.p.m., and each drives a generator rated at 20,000-kw. continuously, 23,500-kw. for two hours, and 30,000-kw. for a half-hour. The generators deliver three-phase, 25-cycle, 11,000-volt alternating current.

Though consisting of three separate elements, the entire machine is started, synchronized, and controlled as a single unit. At the same time, any one or two of the elements can be shut down without interfering with the remainder. The three small elements are mechanically much stronger than a single large one would be; the temperature differences in any cylinder are considerably less, and commercially common materials, with moderate blade speeds and stresses, can be used.

All the turbines are of the pure reaction type, without the usual impulse elements, as this construction is considered preferable in view of the great volumes of steam to be handled. The governing mechanism must not only control the unit as a whole, but also each turbine operating separately. Each turbine also has an emergency stop, which will operate automatically in case the governor fails and the turbine begins to race.

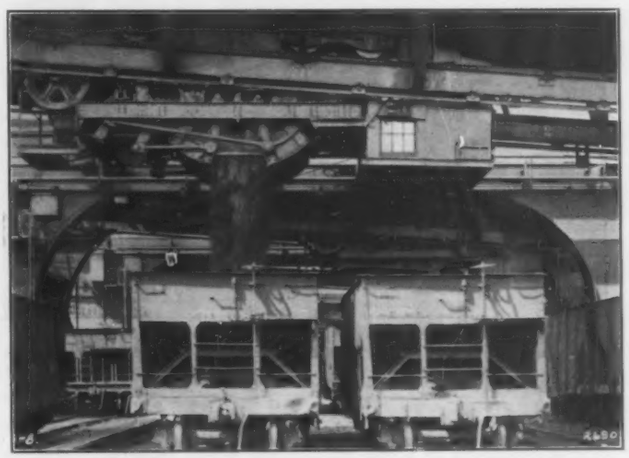
The steam consumption of the entire unit at its point of best efficiency is 10.7 lbs. per kw-hr.

AUTOMATIC ORE UNLOADER

An automatic unloader, manufactured by the Wellman-Seaver-Morgan Company of Cleveland, Ohio, has proved to be a most successful device for loading ore cargoes from lake steamers. Although it is of immense proportions, the design has been much simplified and the control perfected to such a point that the machine is very easily operated.

The unloader consists of a main framework mounted on trucks which travel along the runway rails. The main framework extends back to the rear runway over a temporary storage pile where the ore can be discharged if desired. Between the front and rear runways, space is provided for railroad tracks where ore-carrying cars are placed under the machines and loaded with ore for transportation to the furnace plants. The girders of the main framework form a support for runway rails, on which a trolley travels. This trolley supports a balanced walking beam, from the outer end of which a stiff bucket leg depends. At the lower end of this leg is the bucket, which is operated by machinery located on the walking beam. All horizontal movements of the bucket are accomplished by means of moving the trolley backwards and forward on the girders. The vertical movements of the bucket are accomplished by the operation of the walking beam. The forward portion of the beam being out of balance, the bucket descends by gravity as soon as the brakes of the hoisting mechanism are released.

The hoisting mechanism controlling this operation is located in the enclosed house at the rear end of the walking beam. Ropes from the winding drums of this mechanism pass around sheaves located in the rear end of the trolley and are anchored to the rear end of the walking beam.



Scale larry, into which the main hopper discharges the ore. This larry accurately weighs the ore and discharges it into cars or into storage.

In addition to the main parts of the machine which we have described, there is also a receiving hopper located at the forward end of the main framework and between the main

On the docks at Ashtabula are eight of these electrically operated unloaders. Each machine is equipped with a suitable mechanism for accurately weighing the ore.

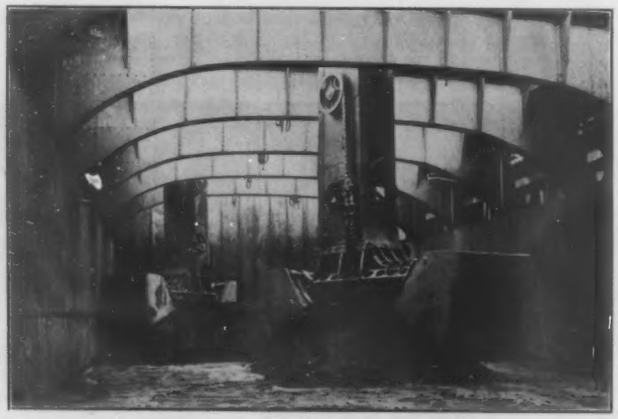
girders, provided for the purpose of receiving the ore discharged from the bucket. The capacity of this hopper is about three full bucket loads, and its purpose is to act as a balancing point for the ore between the bucket and the cars, or storage, as the case may be. The bottom of the hopper is provided with outlet gates and the contents are discharged as required into a larry which runs on an auxiliary track suspended from the under side of the main girders.

The larry, after receiving its load from the main hopper, moves to a point so that its contents can be discharged either into the cars standing on the railroad tracks beneath the main span of the girders or into a temporary storage pile at the rear of the machines.

Machines of this type have been made in two sizes, the smaller size having a capacity of ten tons and the larger size having a capacity of seventeen tons in the bucket shells. The machine shown here is electrically operated throughout, and its speeds are regulated so as to operate through a complete cycle in about 50 seconds.

Some idea of the capacities of unloading by this method may be derived from a record which was made by eight machines of this type having a capacity of fifteen tons each, unloading seven boats having a total capacity of 70,000 tons in 22 hours actual time.

Only two operators are required for the entire operation of one of these machines. One of the operators, whose station is in the bucket leg directly over the bucket shells, controls all of the motions of raising and lowering the bucket, of traveling the trolley back and forth, and moving the machine



Unloader leg and bucket at work in the hold of a boat. The leg is so mounted in the walking beam that it can rotate in a circle, allowing the bucket to reach out in all directions.

along the dock from one hatch to another. The second operator is stationed in a cab on the larry and from this station he controls the movement of the larry, the operation of the larry gates, and the weighing of the ore.

Records extending over considerable periods show an unloading cost ranging from 2½ to 4½ cents per ton, which includes superintendence, labor, repairs and materials on the machines, as well as the cost for power and light.

NEW BELL RINGERS

The complete new line of bell ringing transformers just placed on the market by the General Electric Company, Schenectady, New York, comprises nine standard ratings, divided into two general classifications. The household type is intended for the ordinary signal systems found in residences. The heavy duty types are for larger and more powerful signal systems in office buildings, hotels, apartment houses, mines, industrial plants, etc.

In the first class is the household size transformer, having ample capacity for all ordinary residential requirements, and built in three ratings, as follows:

For 110-volt, 50-140 cycle service
For 220-volt, 50-140 cycle service
For 110-volt, 25- 49 cycle service

The heavy duty types are made in nominal rated capacities of 50 and 100 watts. Three secondary voltages are provided on these sizes, experience having shown this to be desirable on account of diversified requirements met with in this class of installations.

The transformer is designed for high electrical efficiency, core losses being exceptionally low. Careful attention has been paid to avoiding any hum. All current carrying parts are completely surrounded by steel, thus meeting Underwriters' requirements, so that no additional steel box for enclosing the transformer is required in installation.

The transformers are finished in green enamel, and packed in attractively labeled individual cartons. The parts for these transformers are also available for transformers for other purposes, such as toy transformers, special relay autotransformers, etc.

A USEFUL CHART

A chart which gives the relations in any shaft between the power shaft diameter, torsional stress and speed, has been prepared by one of the engineers of the Wellman-Seaver-Morgan Company of Cleveland, Ohio. Given any three of the factors—power, speed, allowable torsional stress and shaft diameter—it is possible to determine the fourth from the chart. The company is willing to send copies of the bulletin containing the chart to all engineers and draftsmen without charge.

ELECTRIC CAR BREAKS RECORD

At the recent National Electric Light Association meeting at Atlantic City, a special record run was made in which a Raulang Electric was the central figure. An interesting paper was read on the Electric Car on the first day and at the suggestion of the New York Edison Company a Raulang Electric was driven against time from New York to Atlantic City to properly inaugurate the convention.

The run was made under the direction of Herbert Mould of the New York Edison Company and the car driven by D. P. Stagg. The previous record was five hours and fifty-seven minutes for the one hundred and nineteen miles. The Raulang made it in five hours and thirty-nine minutes elapsed time. The car was equipped with Exide batteries, forty-five cell, fifteen thin plate.

Books and Bulletins

The Insulator Book

The Locke Insulator Manufacturing Company of Victor, N. Y., has issued a very distinctive publication under the title of "The Insulator Book." It aims to give a concise statement of the art of electric power transmission, beginning with a general history and continuing with a discussion of insulating materials, insulator design, insulator testing, line protective devices, arrangement of conductors, and so forth.

The book is strongly bound and very fully illustrated with photographs and line drawings. It is printed on heavy glazed paper, with particularly clear type arrangement, and is very convenient to handle.

At the end are numerous tables, of distinctly practical value.

New House Organ

The initial number of a new house organ appeared very recently—The Youngstown Sheet & Tube Bulletin. Its purpose is to increase corporate feeling among the employes, and as far as possible the magazine will be their own work. In this first number all the material, including the art work, was contributed by the employes; the photographs were made by the company's own photographic department, and only the engraving and printing were done outside.

Bureau of Standards

Technologic Paper No. 124 issued by the Bureau of Standards is "Constitution and Microstructure of Silica Brick and Changes Involved through Repeated Burnings at High Temperature," by Herbert Insley and A. A. Klein. The investigation involves a petrographic microscopic study of test cubes and commercial silica brick, some of which had received repeated burnings by use in kilns.

The Bureau of Mines also issues a paper by W. C. Phalen on "The Present Situation in the Magnesite Industry."

Hydroelectric Report

The Hydroelectric Power Commission of the Province of Ontario has published its eleventh annual report covering activities for the year ending October 31, 1918. It contains a complete review of the hydroelectric systems of the province, the construction work carried on during the year, the financial position, legal proceedings and general activities of the Commission, together with a number of photographs, maps, charts and tables.

Batteries for Trucks and Tractors

Electrically propelled trucks or tractors, now found in manufacturing establishments throughout the country, are largely used in railway and wharf haulage and in mines. These applications are shown in an interesting booklet just issued by The Electric Storage Battery Company of Philadelphia, the manufacturer of the "Ironclad-Exide" Battery, whose batteries are extensively used in the industrial truck and mine locomotive. Copies of this book can be secured from any sales office of the company or by direct request to their general offices at Philadelphia.

Miscellaneous

Extracts from an address by Otto H. Kahn before the Carnegie Institute, Pittsburgh, have been published in pamphlet form under the title "Capital and Labor—A Fair Deal."

The Electric Storage Battery Company of Philadelphia, Pa., have ready for distribution a revised booklet describing the "Ironclad-Exide Battery."

The Safety Bulletin for July, 1919, has been published by the Bureau of Safety, Chicago.

Heavy Electrical Construction Materials

A well arranged and attractive catalog is issued by the General Devices and Fittings Company of Chicago, describing their heavy electrical construction materials. The catalog is designed to give the engineer the information necessary in making his layouts or detail drawings and for matching up of various units of equipment. This information is given in the form of individual sheets and printed on bond paper on one side only for the convenience of draftsmen or others frequently using the sheets. They are punched for binding in the catalog cover supplied, and an individual sheet can be readily removed for use.

Theater Dimmers

In order to reach theater electricians, contractors, architects and others interested in the control of lighting effects in legitimate and "movie" theaters, as well as lodge halls and churches, The Cutler-Hammer Manufacturing Company of Milwaukee has prepared a 28-page, 8½-in. by 11-in. booklet entitled "C-H Theater Dimmers." The booklet contains 33 illustrations of installations selected from a list of houses which cover the majority of the principal theatrical centers of the United States. These illustrations of theater dimmers and switchboards will serve well the theater electrician or contractor, because they show the latest practice in theater lighting control equipment. The details of a typical large equipment are given in the copy matter. Particular emphasis is given to the play of color and the shifting color harmonies secured through the use of this large dimmer bank. Details of construction and operation, typical methods of mounting and other interesting features are included in the descriptive matter.

Large Power Drives

The Morse Chain Company of Ithaca, N. Y., send out a neat catalog, their latest publication, showing Morse Chain Drives as applied to 100-hp. up to 5,000-hp. This is listed as Publication No. 14, and is a revised edition. It has an attractive cover in cinnamon and gold and a large number of interesting illustrations.

Household Appliances

The Simplex Electric Heating Company of 85 Sidney St., Cambridge, Mass., issue two cheerful display cards, one showing their domestic iron, the other their new No. 27 domestic range. These cards are being sent to their leading distributors.

The Railroad Problem

"The Railroad Problem: Comments on Certain Methods Suggested for Solving It" is the title of a paper by Robert S. Lovett, president of the Union Pacific System. The discussion is divided into two parts—the first an analysis of the weakness of certain proposed plans, the second the presentation of what the author considers a sound remedy. The latter embodies compulsory federal incorporation, exclusive federal regulation of railroad securities, exclusive federal regulation of freight and passenger rates and the creation of a government Department of Transportation.

Annual Reports

The fourth and fifth annual reports of the Public Utilities Commission of the state of Colorado are combined in a recently issued report covering the biennial period, December 1, 1917, to November 30, 1918. It includes a review of decisions, orders and rulings, of steam and electric railroads, a section on engineering and statistics on various utilities.

The Board of Public Utilities of the City of Los Angeles has issued its ninth annual report, covering transactions for the fiscal year beginning July 1, 1917 and ending June 30, 1918. It embraces reports and statistics on Electric, Gas, Telephone and Water Utilities, Railway Transportation, and Jitneys and Interurban Motor Buses.

NEW ELECTRICAL DEVELOPMENTS

(Various power and irrigation projects are reported from the Northwest as being under way, or contemplated. Satisfactory progress in the financing of the Hetch Hetchy undertaking is reported in the Pacific Central district, as well as numerous important irrigation items. In the Southwest irrigation plans are featured, while the Intermountain district shows great activity in new installations, transmission lines and city improvements.—The Editor.)

THE PACIFIC NORTHWEST

MORTON, WASH.—The Morton Electric Company's plant has been sold to J. P. Haggerty of Tacoma for $19,000.

SPOKANE, WASH.—The Universal Electric Company will erect a building at 1218 Second street at a cost of $10,000.

SEATTLE, WASH.—An estimate of $1,520,335 for supplies for the light department has been approved by the city council.

SEATTLE, WASH.—The Acme Motor & Machine Company has been incorporated for $15,000 by M. R. Farrell and others.

SEATTLE, WASH.—J. Bechler, Mayflower Dairy, 917 Virginia street, is to erect a brick power house at a cost of $24,000.

HOQUIAM, WASH.—Plans and specifications have been completed by the Commercial Club for a curb lighting system on 8th and 9th streets.

TACOMA, WASH.—Tacoma has voted to acquire the Lake Cushman power site, the ultimate capacity of which is estimated at 75,000 horsepower.

COLFAX, WASH.—The Washington Water Power Company of Spokane is planning to spend about $28,000 this fall in putting in a heavier line to the city.

VALE, ORE.—Barring any unforeseen accidents the big dam at Riverside should be completed by October 1, according to present observation of those in charge.

EUGENE, ORE.—The Public Service Commission of Oregon has granted to the Oregon Power Company authority to increase its gas rates in the cities of Eugene and Springfield, Ore.

MARSHFIELD, ORE.—The Mountain States Power Company has been granted permission by the Public Service Commission of Oregon to increase its rates in the cities of Marshfield and North Bend, Ore.

SEATTLE, WASH.—An ordinance has been pased by the city council authorizing the Board of Public Works to continue the work of investigation to determine the proper location for dams and reservoirs in the vicinity of Ruby, Gorge Creek and Diablo Canyon.

SEATTLE, WASH.—Revenue derived from the operation of the municipal street railway during 1918 will aggregate $7,017,000, according to an estimate filed with the city council by Supt. Thomas F. Murphine. Budget estimates submitted to the council by Supt. Murphine call for a total expenditure during the year of $7,002,250.

BEND, ORE.—Resale of the bonds of the Suttle Lake irrigation project which has been under the supervision of J. F. Slarkson, of the G. F. Standifer Construction Co. of Vancouver and Portland, is about complete, according to Harry J. Chenowith, of Grandview, secretary of the project, and as soon as this has been completed work will begin.

BEND, ORE.—T. H. Foley, manager of local interests of the Bend Water, Light & Power plant, announces that construction of a 1000-kw. steam plant to cost about $100,000 will be started at once, doubling the capacity of the power house here, and to be completed by February 1, 1920. The plan for construction of the $125,000 plant on Tumalo creek, work on which was to have started this summer, will be held over until the coming summer.

PORTLAND, ORE.—Application for an increase in rates which will enable the company to realize a return of seven per cent on its investment has been filed with the city auditor by the Portland Railway, Light & Power Company as a necessary formality to the hearing to be held soon before the Public Service Commission. The application gives the city ten days in which to prepare and file its answer as one of the affected parties. Whether the city will contest the proceedings is undecided.

PORTLAND, ORE.—Work on the channel to connect Columbia river slough with the Columbia river began recently. The channel is being dug by the city to furnish flow in the slough to make possible use of this waterway for sewer purposes. Deputy City Engineer John R. Hanson, who has been connected with the city engineer's office for 21 years, has been placed in charge of the project, according to City Commissioner Barbur. It will take about one year to complete the job and the cost will exceed $310,000.

KLAMATH, ORE.—The Department of the Interior defends the permit granted to the Oregon-California Power Company to construct a dam at the head of Upper Klamath Lake against which there have been numerous protests. In a letter to Senator Chamberlain, John W. Hallowell, assistant to Secretary Lane, asserts that all interests are protected in the building of this dam. He says the reclamation service needs more water for irrigation and the power company needs more water for power, and that there is abundant water for both. By the terms of the grant the power company is to build the dam and then convey the works to the government in return for the privilege of securing the added power.

OLYMPIA, WASH.—Marvin Chase of the state reclamation board has procured a ruling from the attorney general that $10,000 may be expended from the board's revolving fund for determining the feasibility of a dam at Five Mile rapids in Snake river, regardless of whether the federal government appropriates a like amount for this work. The last legislature appropriated $10,000 for the project, but it is conditioned on a similar federal expenditure, and cannot be otherwise used. Chairman Chase says the preliminary work will be attempted on the reclamation board funds so far as they will go, since the federal government has failed to allow for its share of the expense. The proposed dam is designed for the benefit of the Burbank and neighboring irrigation projects.

THE PACIFIC CENTRAL DISTRICT

HEALDSBURG, CAL.—An election for $20,000 to purchase a park and improve the sewer and light systems is planned here.

OAKDALE, CAL.—Estimates have been prepared by H. S. Crowe, president of the Oakdale irrigation district, giving the probable cost of the proposed Molones dam at $1,469,490.

RICHMOND, CAL.—The Pacific Oil and Lead Company will install 40 horsepower additional motors. This load will be served by the Western States Gas & Electric Company, Richmond division.

OROVILLE, CAL.—E. W. Beardsley, superintendent of the Great Western Power Company, has announced that the work on the Caribou Power Plant will be completed by October or November of 1920, which is six months in advance of the date expected.

MARYSVILLE, CAL.—The city council has granted the Sacramento Northern Railroad Company a permit to erect a freight and passenger station on their lot at E and Second streets, at a cost of $30,000. The construction will cover a depth of 320 feet. The width of the building will be about 100 feet. Material is on the ground.

OAKDALE, CAL.—To take care of the constantly increasing demand for water in the Oakdale irrigation district, the directors are planning on buying a steam shovel to be utilized in widening and deepening the canals. The estimated cost of the steam apparatus is $10,000.

STOCKTON, CAL.—The National Paper Products Company has made application to the Western States Gas & Electric Company for service for 250 horsepower in motors which they are adding to their present equipment. The paper company's present load amounts to 1100 horsepower, which operates approximately 65 per cent load factor.

SONORA, CAL.—A little over one mile of the long tunnel that will be a part of San Francisco's Hetch Hetchy water system has been completed, and progress at the rate of approximately 175 feet per day is now being made. The tunnel will be a fraction over 18 miles in length and will be the link in the wonderful aqueduct that will connect Early Intake with the proposed dam near Priest's station.

WOODLAND, CAL.—Construction of a two-mile spur railroad track into the Conaway 32,000-acre tract is to be started by the Sacramento Northern Railroad. The poles and ties have already arrived. B. F. Conaway is to bear the brunt of the expense. The new spur will mean that heavy shipments of rice from the Conoway farm will be brought to the Woodland mills and warehouses.

BAKERSFIELD, CAL.—A special election was held recently in the proposed Kern County Water Works District No. 1, at which was submitted the proposition of forming a district and incurring an indebtedness of $40,000 by the issuance of bonds of the district to pay the cost of the proposed improvement. Bonds will bear interest at the rate of 6 per cent per annum, payable semi-annually.

OLINDA, CAL.—Consulting Engineer Thomas Means of the Happy Valley irrigation district, Shasta county, accompanied by State Engineer McClure, came up from San Francisco to investigate and inspect the foundation of Messelbeck Dam, now under construction on Cottonwood Creek, near Ono. The Happy Valley irrigation district system, when completed, will irrigate some 18,000 acres of rich land in Happy Valley.

AUBURN, CAL.—A large number of ranchers from Placer county held a conference in Auburn with A. C. Adams, chief of the Irrigation Investigation Bureau of the U. S. Department of Agriculture, and H. M. Cooper, representing the Pacific Gas & Electric Company. Unused water from the upper power ditches of the company is desired for irrigating 9000 acres of land recently opened to cultivation and fruit. A meeting before the Railroad Commission has been arranged.

SAN FRANCISCO, CAL.—While the records of the Mercantile Trust Company showed recently that over 96 per cent of the stockholders of the Northern California Power Consolidated had deposited their stock in assent to the sale of the properties to Pacific Gas and Electric, it appears that the very small minority comprises vigorous protestants against the terms of the sale. These have taken the necessary steps to formally oppose the transaction when it comes before the Railroad Commission, and have already filed their protest.

PARADISE, CAL.—Distribution of water over the Paradise irrigation district system has been cut off for a few days as the result of 40 feet of the main canal going out. The section out is between the dam and the intake, and a flume is being constructed to carry the water past the point. It is now proposed to put in a 36-inch pipe for the main canal at some time in the future. It is estimated that this, with other improvements, will cost $140,000. A bond issue will be necessary.

FRESNO, CAL.—Preliminaries for the formation of the Merced irrigation district have been completed. The district when organized will be the second largest district in the state of California, the largest being the one in Imperial Valley. The plan of the district is to store the flood waters of the Merced river, but this will not disturb any of the prior rights to the waters of that river. The promoters have in view a reservoir six miles long by two miles wide on Dry Creek, near Merced Falls on the north side of the Merced river, to impound the flood water.

SAN FRANCISCO, CAL.—Bondholders of the Pacific Power and Light Company in San Francisco and vicinity will be interested to learn that the Public Service Commission of Washington has rendered a decision fixing the reasonable valuation of the company's properties, serving Yakima, Walla Walla, Goldendale and White Salmon, the company's division known as the "Eastern Washington Section," at $6,207,532. It is on the basis of the valuation of this section that the Public Service Commission has taken under consideration the granting of an increase of rates for which the Pacific Power and Light Company has made application.

REDDING, CAL.—The Railroad Commission has decided recently that purchase of the Northern California Power Company's electricity distributing system, within its corporate limit, may be made by the city of Redding for $42,401, instead of having to pay $226,301 for the company's holdings. Several policies adopted by the commission in the case set a precedent for future decisions in similar cases now pending. Valuation of the plant was based on reproduction cost, as shown by prices of material and labor during the year immediately preceding the date of the application, less actual depreciation. Formerly it was the practice to base valuation figures on the costs incurred during a long period of years.

SAN FRANCISCO, CAL.—Three San Francisco financial institutions recently purchased $5,570,000 of Hetch-Hetchy 4½ per cent bonds, the money to be used in the construction of the Hetch-Hetchy dam in the Tuolumne river. At a later date the same syndicate will take $430,000 more of the bond issue, having agreed to purchase $6,000,000 at the time the contract for construction of the dam was let to the Utah Construction Company.

THE PACIFIC SOUTHWEST

LOS ANGELES, CAL.—The Perris Valley Irrigation Company has been granted a certificate for increase of its capital stock to $26,000.

BRAWLEY, CAL.—An election will be held on September 15 to vote on $2,500,000 district bonds, for irrigation and canal improvements recommended by the state bond commission.

LOS ANGELES, CAL.—The Los Angeles Railway Company will erect a new office building at the northeast corner of Broadway and 11th street, to cost $400,000, as announced by W. H. Dunn, president.

LOS ANGELES, CAL.—A dam will be constructed in Thompson Creek, northeast of the Gale Goat Ranch. A dam will also be constructed in Live Oak Canyon in the gorge below Camp Eno. The reservoir will hold 400 acre-feet of water and will be large enough to hold the water from any storm.

LOS ANGELES, CAL.—Application has been made by the Pacific Electric Railway for authority to construct spur tracks at the grade crossing on Central Avenue to serve the Goodyear Rubber Company plant on the Ascot Park property.

SANTA BARBARA, CAL.—Santa Barbara Gas and Electric Company is asking for bids from the holders of its first mortgage serial and sinking fund gold bonds, due July, 1941. The company wants to pay off $240,000 face value, and asks the price desired for the same. These bonds were marketed here last year by E. H. Rollins & Sons.

PASADENA, CAL.—The Warnerlite Company of Davenport, Iowa, manufacturers of lighting plants and electrical products for automobiles, will start within six months in Pasadena on the construction of a $100,000 factory building to form the first unit of a plant in Pasadena that will manufacture products to supply the Pacific Coast and export trade of the company.

LOS ANGELES, CAL.—Southern California Edison Company is making the formal offer to its stockholders, as authorized by the Railroad Commission, of subscription to the new issue of 25,000 shares. Each stockholder of record August 15 may subscribe to as many shares as he desires, but the company reserves the right of final allotment pro rata to the present holdings. The price fixed is $90 per share, payable in cash, or $91 a share, payable $6 with the subscription, and the balance at $5 a month. Any of this stock left unsold on September 1 will be offered to the public.

IMPERIAL, CAL.—A project for the irrigation of the Imperial Valley by construction of a canal across the southern extremity of California at a cost of $30,000,000 has been presented to President Wilson by J. R. Swing, Mark Rees, O. N. Shaw of the Imperial Valley and Thomas C. Yager of Coachella Valley. The purpose of the project is to prevent the waters of the Colorado river, now being drained by the Alamo canal, from being exclusively utilized by Mexico. The Alamo canal is a wasteful project, they say, and eventually will turn a section of 500,000 acres into an arid territory. The $30,000,000 expenditure has been approved by Secretary of the Interior Lane.

THE INTER-MOUNTAIN DISTRICT

REXBURG, IDA.—This city has just granted a renewal of franchise permitting the Utah Power & Light Company to operate within its limits until July 1, 1969.

TREMONTON, UTAH.—Work has been begun on the installation of a new street lighting system for this city. The new installation should be in operation by September 1st.

BONNER'S FERRY, IDA.—The Washington Electric & Supply Company of Spokane is considering the matter of installing a street lighting system here, to include 14 lamp posts.

PUEBLO, COLO.—Three large coal mines operating in Canon City district are negotiating with the Arkansas Valley Railway, Light and Power Company for additional power service aggregating 1500 horsepower.

PROVO, UTAH.—The Utah Irrigation Company are considering the advisability of installing additional pumps at their plant near Saratoga. This is one of the largest irrigation projects in the intermountain country.

LIBBY, MONT.—It is reported that the Lukens-Hazel Mining Company will expend $240,000 for a 200-ton concentrator and power plant. A pipe line will be installed from Granite Creek which will develop 600 horsepower.

BRIGHAM CITY, UTAH.—The Utah Idaho Central Railroad Company has been given permission by the Public Utilities Commission to tear up its tracks in this city, due to lack of sufficient business to pay operating expenses.

IDAHO FALLS, IDA.—About two thousand acres of land located about one mile west of Bassett on the railroad between Idaho Falls and Roberts has been reclaimed by the installation of electrically driven pumping equipment for irrigation.

SALT LAKE CITY, UTAH.—The Dixie Power Company has made formal application to the Public Utilities Commission for permit to construct one hundred miles of transmission line from Cedar City through Iron and Washington counties to St. George.

PUEBLO, COLO.—An industrial delevelopment corporation is being organized in Pueblo for the purpose of raising a fund of $50,000 to be devoted to research work and securing data concerning its resources, to be used in a campaign to induce factories to locate there.

RIGBY, IDA.—Electric service to this community will be improved by connection of the system to the Grace plant in addition to the Idaho Falls plant of the Utah Power & Light Company, the Grace plant being the main source of supply for the entire system of the company.

OGDEN, UTAH.—Owing to the large number of fires in the industrial section of this city, presumably started wilfully, a concerted movement has been started toward the installation of protective flood lighting in the hope that this will materially cut down the work of the vandals.

LOGAN, UTAH.—An ornamental street lighting system will shortly be installed on the campus of the Utah Agricultural College. Steel fluted lamp posts on a cement base will be used and each will be mounted with a 400-candlepower lamp. This new lighting installation is part of a scheme to make the college grounds one of the most beautiful in the entire West.

BUHL, IDA.—The directors of the Jarbridge-Buhl Mining Company have contracted with the Idaho Power Company for a power line leading up from Jarbridge to the Altitude property. The cost of this power line and transformers will be about $8,500. The directors will spend about $500 for compressors, drills and electric hoists, bringing the total to $11,000.

CARSON CITY, NEV.—The Tonopah Divide and Goldfield Electric Railroad Company has been incorporated under the laws of Nevada for the purpose of operating an electric railway between Tonopah and Divide, a distance of six miles. Charles Stout, of Reno, heads the incorporators. The road will cost approximately $1,000 per mile, a total of $6,000, exclusive of equipment. Eventually the line may be extended to Goldfield.

BOISE, IDA.—The Idaho Power Company has placed orders for machinery necessary for installation of a new 8000 horsepower addition to the plant at Thousand Springs on Snake river. The surveys necessary to prepare all plans and specifications in connection with the new installation have been completed, and by October 1st the company will have a large crew of men at work at Thousand Springs for the purpose of completing the building so as to receive the machinery as soon as shipped. The manufacturers of the machinery have promised shipment in plenty of time so that the entire plant will be finished and in operation prior to the beginning of the 1920 pumping season. Additional improvements have been authorized for installation of control gates and for dredging operations at the Swan Falls power plant.

IDAHO FALLS, IDA.—Work is well under way on the construction by the Utah Power & Light Company of the 44,000-volt transmission line to be constructed from Grace to Idaho Falls, via McCammon, Pocatello, Blackfoot and Shelley. The Idaho Power Company will build the section of lines between Pocatello and Blackfoot. The Phoenix Utility Company is doing the rest of the work under contract for the Utah Power & Light Company. In addition to the main trunk lines, an extension will be made southward from McCammon to Downey. In the Idaho Falls division a new 44,000-volt transmission line will be constructed from Idaho Falls station nearly to Roberts, and extensive improvements will be made in the entire territory between Idaho Falls and Rigby. The main transmission line is to supply additional power needed in the Idaho Falls territory and to effect an interchange with the Idaho Power Company mutually beneficial to both companies.

THE VACUUM CLEANER —— THE VACUUM CLEANER

MULLIGAN is the most famous of all camp dishes—and one of the best. Like this page, it contains a little of everything left in camp, seasoned with a bit of onion and served when piping hot. In an editorial office such bits of good material, not being edible, are likely to collect in corners and drift about until picked up eventually by the Office Vacuum Cleaner. In order to preserve them for the interest of our readers, this page has been turned over to that electrical worthy for their display. Season with a bit of humor—and serve hot.—The Editor.

◆◆ THE MODERN INDUSTRIAL RACE ◆◆

This cartoon, by Bronstrup, appeared not long ago in the San Francisco Chronicle. We agree, of course. That's why we reproduce it.

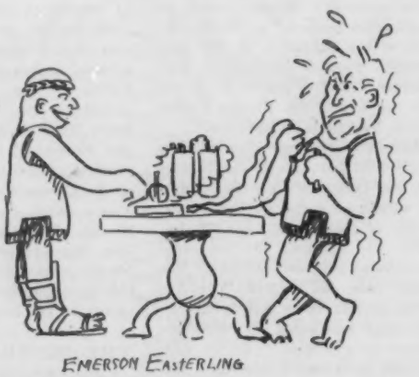
"John Doe" appears to be a mysterious character whose name is badly mixed up with that of former soldiers and sailors who served Uncle Sam during the World War. The War Risk Insurance Bureau sent thousands of specimen insurance policies to returned service men to show just what benefits and advantages Uncle Sam provides for them in recognition of the services they rendered their country. These policies are filled in as a matter of form with the honored name, "John Doe."

Scores of these policies have been returned to the Bureau by anxious service men who fear that an error has been made and that one of their pals is being discommoded because of the fact that his insurance policy is in their hands, being unaware, evidently, that "John Doe" is a name which has been used in legal parlance to designate an unknown party since the days of Blackstone.

"Am returning policy addressed to me, that you may rectify the mistake," said one of these letters, "and deliver it to the proper party. The name of the man to whom the policy is made out is not my name."

By the way, what various vicissitudes might enliven the existence of a man whose name really was John Doe.

Speaking of modern improvements — wouldn't old Cleo have been silly with joy over one of our present-day fans, and what more naughty things history



would have had the gossipy exhilaration of recording as liabilities against the character and conduct of old Nero had that overgrown kid possessed a medical shocking coil!

—EMERSON EASTERLING.

FOOLISH SELLING ARGUMENTS — I.

If musical customers are troubled by not being able to keep the tune, this will give them the air.

THE VACUUM CLEANER —— THE VACUUM CLEANER

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